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ORGANIZATIONAL, DS, GS, AND DEPOT MAINTENANCE MANUAL

SIERRA 2 KW KLYSTRON AMPLIFIER MODEL 2002

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HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 1967

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WARNING

DANGEROUS VOLTAGES

EXIST IN THIS EQUIPMENT

Be careful when working on the power supplies and their circuits, or on the 115-volt ac line connections.

DO NOT TAKE CHANCES!

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TM 11-5820-707-15

TECHNICAL MANUAL
NO. 11-5820-707-15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 24 July 1967

Organizational, DS, GS, and Depot Maintenance Manual

SIERRA 2 KW KLYSTRON AMPLIFIER MODEL 2002

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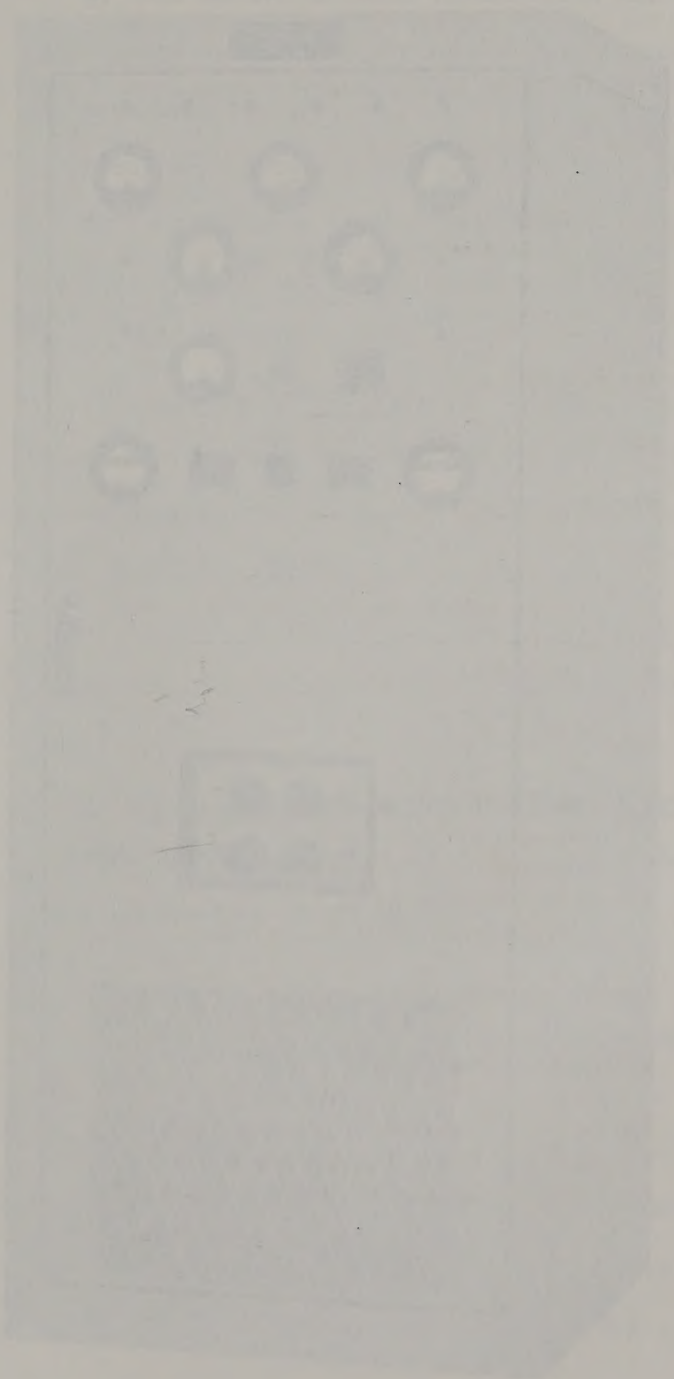


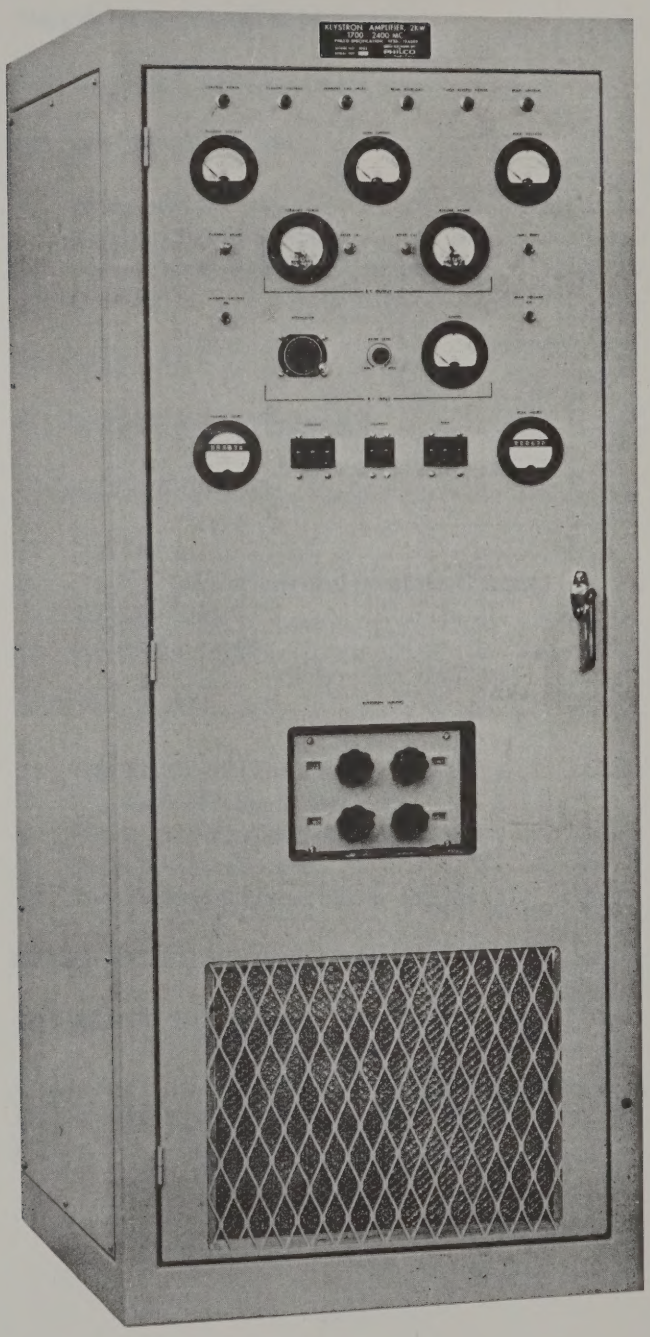


Figure 1-1. Model 2002 Klystron Amplifier

SECTION I
GENERAL

A. SCOPE

a. This manual includes installation and operation instructions and covers operator's, organizational, direct support (DS), general support (GS), and depot maintenance. It describes Sierra (Federal supply code 94668) Klystron Amplifier, 2 KW Model 2002.

b. A basic issue items list for this equipment is not included as part of this manual.

A.1. INDEX OF PUBLICATIONS

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

A.2. FORMS AND RECORDS

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58.

c. Reporting of Equipment Manual Improvements. Report of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-MR-NMP-AD, Fort Monmouth, N.J., 07703.

A.3. PURPOSE

The Sierra Model 2002 Klystron Amplifier is built to furnish an RF output of 2 kilowatts over the frequency range of 1.7 to 2.4 GHz, with a power input of 0.5 watts, when tuned for broadband operation.

B. DESCRIPTION

The RF Power Amplifier is completely contained in one cabinet. All operating controls and indicators are mounted on the door of the cabinet with the exception of the klystron tuning controls which project through an opening in the lower center. The door is full cabinet size and opens to the left. When opened, the klystron and other components are readily accessible. An air intake filter is mounted in the lower section of the door.

The klystron tube and tuning control assembly may be removed as a unit. Guard rails are fitted to the bottom of the assembly so that it may be set on a flat surface without damaging the very fragile filament-cathode assembly of the klystron. This assembly must always be protected against impact or stress.

The relay-contactor chassis is mounted on the upper left-hand wall of the cabinet. The main AC power input terminal block, the RF input connector and the low voltage relay control supply are also mounted on this chassis.

The high voltage transformer, choke and capacitor and the klystron filament transformer are bolted to a plate in the bottom of the cabinet. The high voltage bleeder and meter multiplier resistors are mounted on the lower right-hand side of the cabinet and the high voltage rectifier blocks and thyrite varistor are mounted on the lower right-hand front.

The terminal board with the tiebar links for line voltage or output power adjustment is located in front of the power transformer toward the lower left-hand side of the cabinet where it is readily accessible.

Two exhaust blowers draw air over the collector and body, the heat sources of the klystron tube, and discharge it into the atmposhere. The blowers are mounted in the upper part of the cabinet and are connected to the klystron and to the vents in the cabinet top with flexible air hoses.

C. SPECIFICATIONS

FREQUENCY RANGE	1.7 to 2.4 GHz
RF POWER OUTPUT	2 kW CW
RF POWER INPUT	0.5 watts nominal
BANDWIDTH	
Maximum Efficiency Tuned	4-6 MHz at 3 db points*
GAIN	40 db
SPURIOUS RADIATION	80 db below carrier
CONNECTORS	
RF Input	Type N, 50 ohm
RF Output	EIA flange 1-5/8" rigid 50 ohm coaxial line
ENVIRONMENTAL CONDITIONS, Operating	
Temperature	+10°C to +55°C
Altitude	12,000 feet
Humidity	97%
Protection	Fungus Resistant
HEAT DISSIPATION	
No Drive	23,000 BTU/h
Full Power Output	16,200 BTU/h
AC POWER INPUT	120/208 VAC, 3 phase 50/60 Hz ±3 Hz 7100 volt-amperes P.F. 95%
DIMENSIONS	
Height	68 inches
Width	28 inches
Depth	28 inches
WEIGHT	725 pounds

*Depends on frequency to which tube is tuned.

SHIPPING DIMENSIONS Floating and Deck	
Amplifier Cabinet	40" x 40" x 77"
Klystron and Small Parts	32" x 22" x 29"
SHIPPING WEIGHT	
Amplifier Cabinet	840 pounds
Klystron and Small Parts	210 pounds

D. INSTALLATION

1. Unpacking

The Amplifier is ordinarily shipped in three packing cases: the Amplifier cabinet, klystron tube and small parts. In some instances the klystron tube and small parts may be packed in one case.

Unpack each case and inspect for shipping damage. The klystron tube should be left in its special container until it is to be installed in the Amplifier. Remove all bracing and tape from the cabinet components. Remove all meter shorts.

2. Cabinet Mounting

Locate mounting holes for the cabinet using the Installation Drawing, Figure 6-1, and bolt to the floor.

3. Electrical Connections

a. Connect the 1-5/8 inch antenna coaxial line to the Amplifier RF output. Be sure the flanges are properly aligned before bolting them together so that no stress is placed on the Amplifier RF output fitting. The output fitting flange sets 1-1/2 inches below the top of the cabinet. Secure the split figerglas plate provided, around the coaxial line to prevent the entrance of unfiltered air.

b. Connect the AC three phase, 208 volt, 60 Hz, four wire input from the load center to TB4-2, -3, -4, and the neutral to TB4-1. The terminal board is located on the relay-contactor chassis in the upper left-hand side of the cabinet. Figure 1-3. Minimum size conductors should be: No. 8 for the three phase line and No. 10 for neutral. Bring the conductors in through the opening in the left rear of the cabinet top.

c. Connect the RF input coaxial line to the type N Fem. connector, J2, on the relay-contactor chassis. Bring in through the same opening as the AC line.

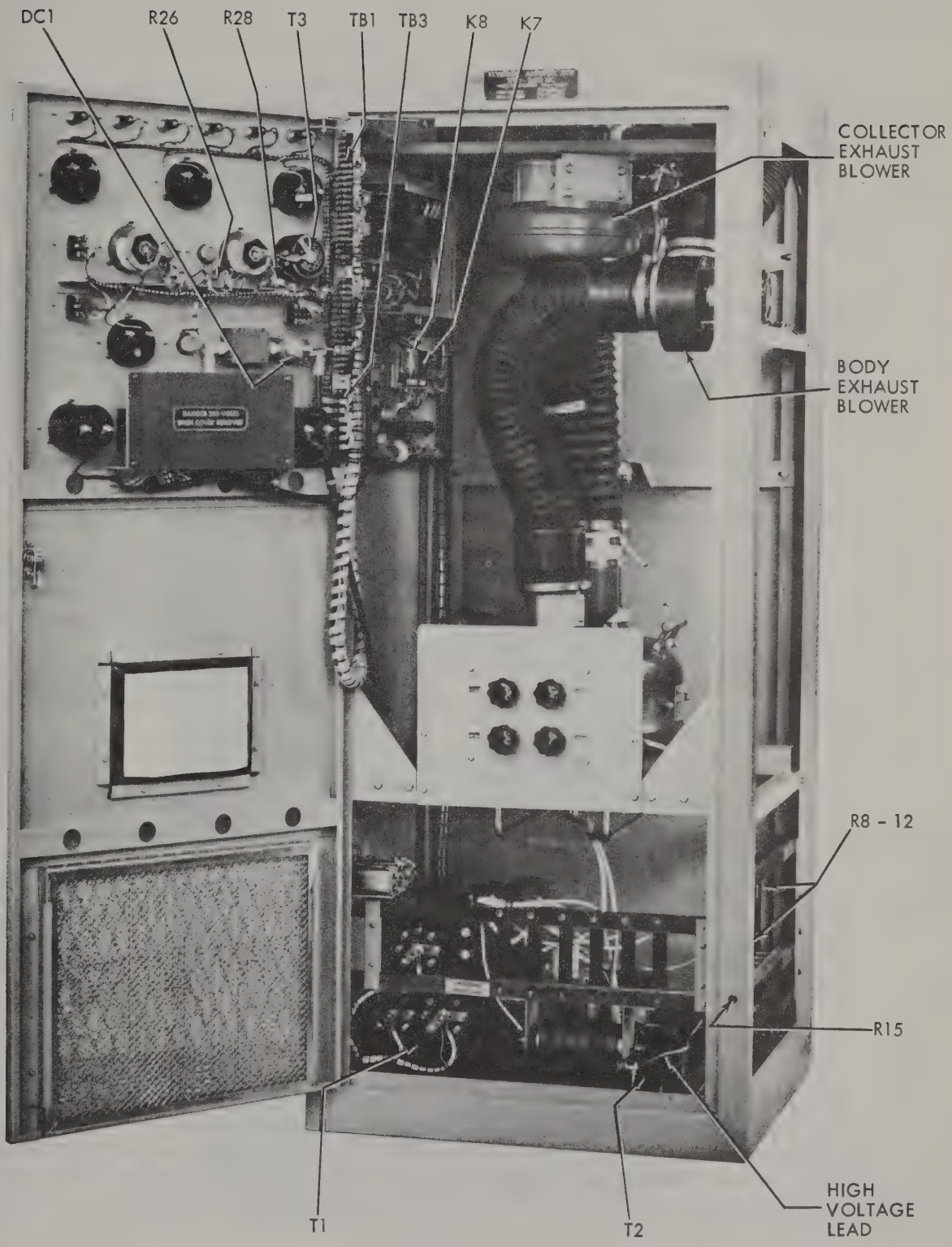


Figure 1-2. Inside View Klystron Amplifier Cabinet, Front

d. Connect the wires for the external low Forward power indicator to TB5 on the relay-contactor chassis. Bring wires through the same opening as the AC line. Figure 1-3.

e. Connect a ground wire to the ground stud located just to the rear of the AC entrance opening.

f. Clamp the insulating entrance fitting provided around the wires to prevent the entrance of unfiltered air. This fitting is a split fiberglas plate with notches for the RF exciter RG9B/U line. Notches must be made in the plate to fit the particular cable or wires used for AC Input, External Indicator and ground. Notches must fit snugly around the wires.

4. Klystron Tube Installation

a. Remove the klystron mounting and tuning assembly from the cabinet. The Assembly is fastened with four machine bolts in the bottom plate.

CAUTION: The klystron tube is assembled with a strong permenent magnet. Remove wrist watch when working around the klystron tube. Hold all ferrous metal tools firmly as they may be pulled to the magnet with unexpected force.

b. Remove klystron tube from packing case and carefully lay on its side on a flat uncluttered surface.

CAUTION: The cathode assembly in the bottom of the tube is very fragile. Do not subject to stress or impact. Never rest the weight of the klystron on this assembly or on the protective tube around it.

c. Remove the protective tube from the cathode and then set the klystron on the mounting assembly. The guard rails on the bottom of the mounting assembly prevent the cathode from touching the floor. Fasten the tube to the assembly with the four machine screws provided. Screws fit into four tapped holed in the bottom of the magnets. Assemble with the klystron tuning shafts pointing toward the tuning assembly.

d. Set the counters on the tuning assembly to read 2000. This is the 2.0 GHz reference setting of the tuning charts, Figure 2-2. Connect the tuning assembly shaft couplings to the klystron tuning shafts. Do not turn the klystron shafts in the process. Set the counter shafts as closely as possible to 2000 when the set screws in the couplings are over the flats on the klystron tuning shafts. The klystron tube is set to 2.0 GHz before being removed from the cabinet for shipping. When connected in this way the tuning charts may be used to make the initial setting for any frequency within the range of the klystron tube.

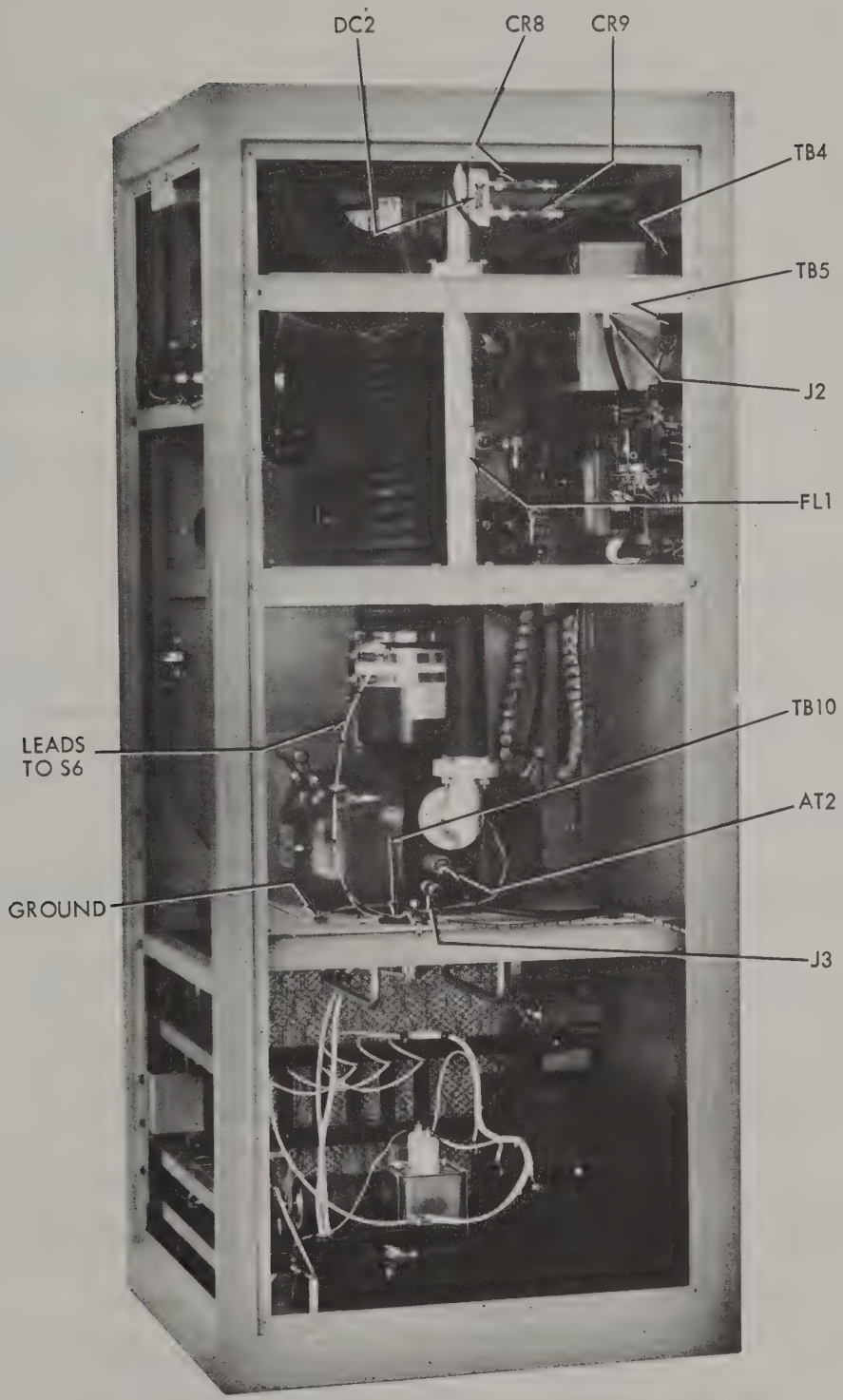


Figure 1-3. Inside View Klystron Amplifier Cabinet, Rear

NOTE: When a new tube, which has been received direct from the tube manufacturer, is to be installed, consult the data sheet accompanying the tube to determine the frequency to which it is tuned and set the counters accordingly.

e. Connect the 5 watt, 50 ohm load, AT2, to the type N connector in the second cavity. When a new tube is installed, transfer this load to the new tube. Figure 1-3.

f. Set the klystron tube and assembly into the cabinet and make connections to the tube as follows:

(1) Connect the collector-body wire (blue) to the binding post on the support for the RF output connection.

(2) Connect the RF input coaxial cable to the type N connector, J3, in the Input, Lower, cavity.

(3) Make the best possible alignment between the klystron output flange and the miter elbow with the assembly plate in its final position (bolts in holes to cabinet frame). Remove the inner connector from the miter elbow to make this alignment. Loosen the screws holding the klystron so that it may be shifted slightly, if necessary, to aid in alignment. Do not move the flexible section any more than is necessary. Retighten the screws holding the klystron to the mounting plate.

(4) Withdraw the klystron mounting assembly slightly and place the inner connector and "O" ring between the klystron output flange and the miter elbow.

(5) Slide the klystron assembly fully into the cabinet and bolt to the cabinet frame. Connect ground wires (green and blue) to screw in right rear corner.

(6) Bolt the miter elbow to the klystron output flange.

g. Connect the Klystron Filament Leads

Connect the heater/cathode lead (white) to the filament transformer secondary terminal to which the lead from the high voltage power supply is connected. Figure 1-2. Connect the heater (yellow) lead to the other secondary terminal.

h. Connect Overtemperature Switch and Air Hose

(1) Slip half the length of the six inch diameter neoprene rubber boot over the top of the klystron collector assembly. Slide two clamping rings down over the boot.

(2) Screw the Overtemperature switch, S6, into the tapped socket on top of the klystron collector assembly. The switch leads must be disconnected from TB10-1, -2 in order to screw the switch into the socket and then reconnected. Figure 1-3.

(3) Set the metal sleeve which is in the end of the six inch air hose into the projecting part of the neoprene rubber boot. Slide the grommet on the wires from the Overtemperature switch, S6, into the slot in the metal sleeve. The boot should come up far enough to cover the slot.

(4) Slide one clamping ring up and clamp the top of the boot to the metal sleeve. Make certain that the metal sleeve does not touch the collector assembly so that heat will not be transferred from the collector assembly to the sleeve. Leave 1/8" - 1/4" space all around. This heat barrier prevents deterioration of the flexible air hose. Tighten the other clamping ring around the lower end of the boot. Leave the top end of the air hose free temporarily.

(5) Place the three inch diameter neoprene rubber boot over the air outlet from the klystron body. Place the wide metal clamp over the rubber boot. Slide the adapter connector in the end of the four inch air hose into the rubber boot and tighten the clamp. Clamp the other end of the four inch air hose to the Body Exhaust Blower. Figure 1-2.

5. Collector Exhaust Blower Rotation

a. Tape upper end of the six inch air hose clear of the relay panel and the inlet to the collector exhaust blower.

b. Turn on power at Load Center. Close COOLING circuit breaker. Turn FILAMENT VOLTAGE switch to On momentarily.

c. Observe rotation of collector exhaust blower rotor through the inlet opening.

WARNING: Do not place hand close to the blower inlet to detect air flow direction, it may be drawn into the blower with unexpected force.

The direction of rotation should be clockwise when viewed from the top, as indicated by arrow molded into the top of the blower housing.

d. If blower rotation is backwards, turn off power at Load Center and interchange any two of the wires of the three phase AC connected to TB4. (Do not touch the neutral wire connected to TB4-1.)

e. Check again for proper rotation (c. and d. above). Turn off power at Load Center. Connect six inch air hose to the inlet of the collector exhaust blower.

6. Klystron Tube Removal

To remove the klystron tube from the Amplifier, follow the procedure of paragraph 4. above in reverse order.

7. Low Forward Power Remote Indicator Connections

The remote indicator relay, K6, provides DPDT dry contact switching for control of a remotely located Low Forward Power indicating device. See the Schematic Diagram for relay connections. Relay switch contacts are rated at 5 amperes for a resistive load. Connections are made to TB5 (Figure 1-3).

SECTION II
OPERATION

A. FRONT PANEL CONTROLS AND INDICATORS

Control or Indicator	Use	Schem. Ref. No.
CONTROL POWER	Panel light: Indicates primary power to Amplifier and FILAMENT circuit breaker closed	DS1
FILAMENT	Panel light: In addition to above, indicates COOLING circuit breaker closed, FILAMENT VOLTAGE ON switch closed and Air Flow switch closed	DS2
FILAMENT TIME DELAY	Panel light: In addition to above, indicates Filament Time Delay relay closed and door interlock switch closed	DS3
BEAM OVERLOAD	Panel light: In addition to above, indicates Beam Overload relay in normal, untripped, position	DS4
HIGH REVERSE POWER	Panel light: In addition to above, indicates High Reverse Power relay in normal, closed, position	DS5
BEAM VOLTAGE	Panel light: In addition to above, indicates BEAM VOLTAGE switch closed and step-start contactors closed	DS6
FILAMENT VOLTAGE	Meter: Indicates klystron filament voltage	M1
BEAM CURRENT	Meter: Indicates beam current flowing in klystron	M3
BEAM VOLTAGE	Meter: Indicates beam voltage applied to klystron	M2
FILAMENT ADJUST	Screw driver adjust variable transformer: adjusts filament voltage. (Guard over control)	T3
FORWARD POWER	Meter Relay: Indicates output power to antenna. Operates relay for remote Low Forward Power indication. Relay operate point adjustable	M5
METER CAL (2)	Screw driver adjust, shaft lock potentiometers: Calibration adjustment for adjacent RF Power Meters	R23, R24

Control or Indicator	Use	Schem. Ref. No.
REVERSE POWER	Meter Relay: Indicates Reverse Power from antenna. Operates relay to remove Beam Power when Reverse Power becomes excessive. Overload point adjustable	M6
FAULT RESET	Spring Return switch: Releases meter relays and resets beam overload relay, except when beam voltage switch is on	S5
FILAMENT VOLTAGE ON	Toggle switch: Connects power to exhaust blowers and, when air flow switch S2 is closed, to klystron filament transformers	S1
BEAM VOLTAGE ON	Toggle switch: Connects power to step-start contactors in beam power supply. Opens Fault Reset circuit to Beam Overload relay	S4
ATTENUATOR	Adjustable Attenuator: Adjusts input drive power to klystron tube Input Cavity	AT1
METER SENS.	Potentiometer: Adjusts sensitivity of Tuning Meter, M8	R27
TUNING	Meter: Indicates reverse power from the klystron Input Cavity to show resonance point during cavity tuning	M8
FILAMENT HOURS	Running Time meter: Indicates hours of klystron filament operation	M4
COOLING	Circuit breaker: Controls power to klystron collector exhaust blower. Provides overload protection	CB1
FILAMENT	Circuit breaker: Controls power to klystron body exhaust blower, control circuits and klystron filament supply. Provides overload protection	CB2
BEAM	Circuit breaker: Controls power to beam power supply. Provides overload protection	CB3
BEAM HOURS	Running Time meter: Indicates hours of klystron beam operation	M7
KLYSTRON TUNING	Klystron cavity tuning controls (4)	V1

WARNING: Lethal voltages exist within the Amplifier cabinet and on TB1 and TB3 on the cabinet door even when all circuit breakers are opened. Always disconnect primary power at the load center before working inside the cabinet. Use extreme care when it is necessary to operate the Amplifier with the door open.

B. START PROCEDURE

1. Beam Transformer Line and Voltage Tap Settings

a. Line voltage taps are provided on the beam transformer to accommodate line voltages of ±10% from nominal. Under ordinary conditions, if the line voltage is more than 5% above or below nominal 208 volts, the higher or lower line voltage taps should be used. This will keep output voltage within approximately 5% of nominal. Line voltage tap settings are normally made as an installation procedure only.

b. Taps are also provided to adjust for various klystron beam voltages and power outputs. These taps may be changed according to power output requirements. Approximate power outputs corresponding to DC beam voltage settings are as follows:

Beam Voltage	Power Output
8.4 kV	2 kW at 2.4 GHz
7.8 kV	2 kW below 2.4 GHz
6.5 kV	1.0 kW
5.4 kV	0.5 kW

Between 2.0 and 2.4 GHz the higher or lower 2 kW beam voltage taps may be used, whichever is required to provide full 2 kW output.

c. Line voltage and power output tap connections are given below. The tie bars must be connected to the same number on each of the three primary connections. Figure 2-1. 10% line voltage taps are numbers 5, 6 and 7. Power output taps are numbers 1, 2, 3 and 4.

Line Voltages	Tap Connection	DC Output Beam Voltage
208	1 and 6	8.4 kV
208	2 and 6	7.8 kV
208	3 and 6	6.5 kV
208	4 and 6	5.4 kV
187	1 and 7	8.4 kV
187	2 and 7	7.8 kV
187	3 and 7	6.5 kV
187	4 and 7	5.4 kV
229	1 and 5	8.4 kV
229	2 and 5	7.8 kV
229	3 and 5	6.5 kV
229	4 and 5	5.4 kV

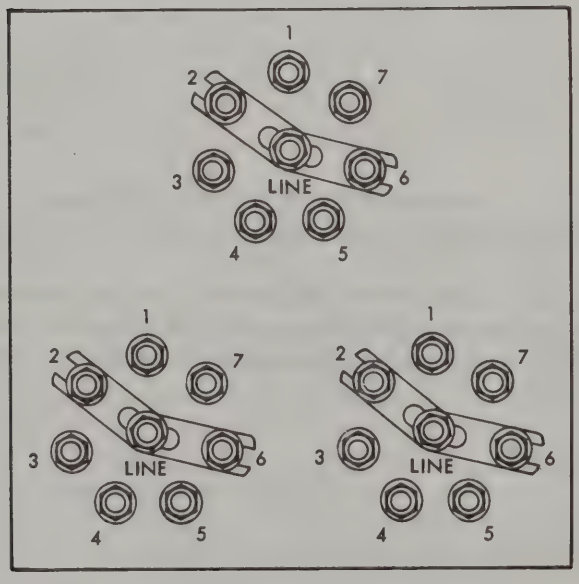


Figure 2-1. Beam Transformer Terminal Board

2. Preliminary Steps

a. Set Beam transformer taps for 0.5 kW output (5.4 kV) for tuneup procedure.

b. See that FILAMENT VOLTAGE ON and BEAM VOLTAGE ON switches are in the Off position.

c. Turn ATTENUATOR control full counterclockwise.

d. Make certain that source of RF drive power is operating normally.

e. Set red pointer on FORWARD POWER meter to maximum counterclockwise position. Set red pointer on REVERSE POWER meter for a maximum of 80 watts. This is the maximum reverse power that may be applied to the Klystron output window.

3. Turn On Procedure

a. Turn on primary power at the Load Center, and close COOLING, FILAMENT and BEAM circuit breakers. CONTROL POWER indicator light will come on when the FILAMENT circuit breaker is closed. The circuit breakers are normally left in the closed position, they are not used as operating controls.

b. Close FILAMENT VOLTAGE ON switch.

Cabinet exhaust blowers will start, the air flow switch will close, the FILAMENT VOLTAGE indicator light will come on and the FILAMENT HOURS meter will start.

c. Observe FILAMENT VOLTAGE meter.

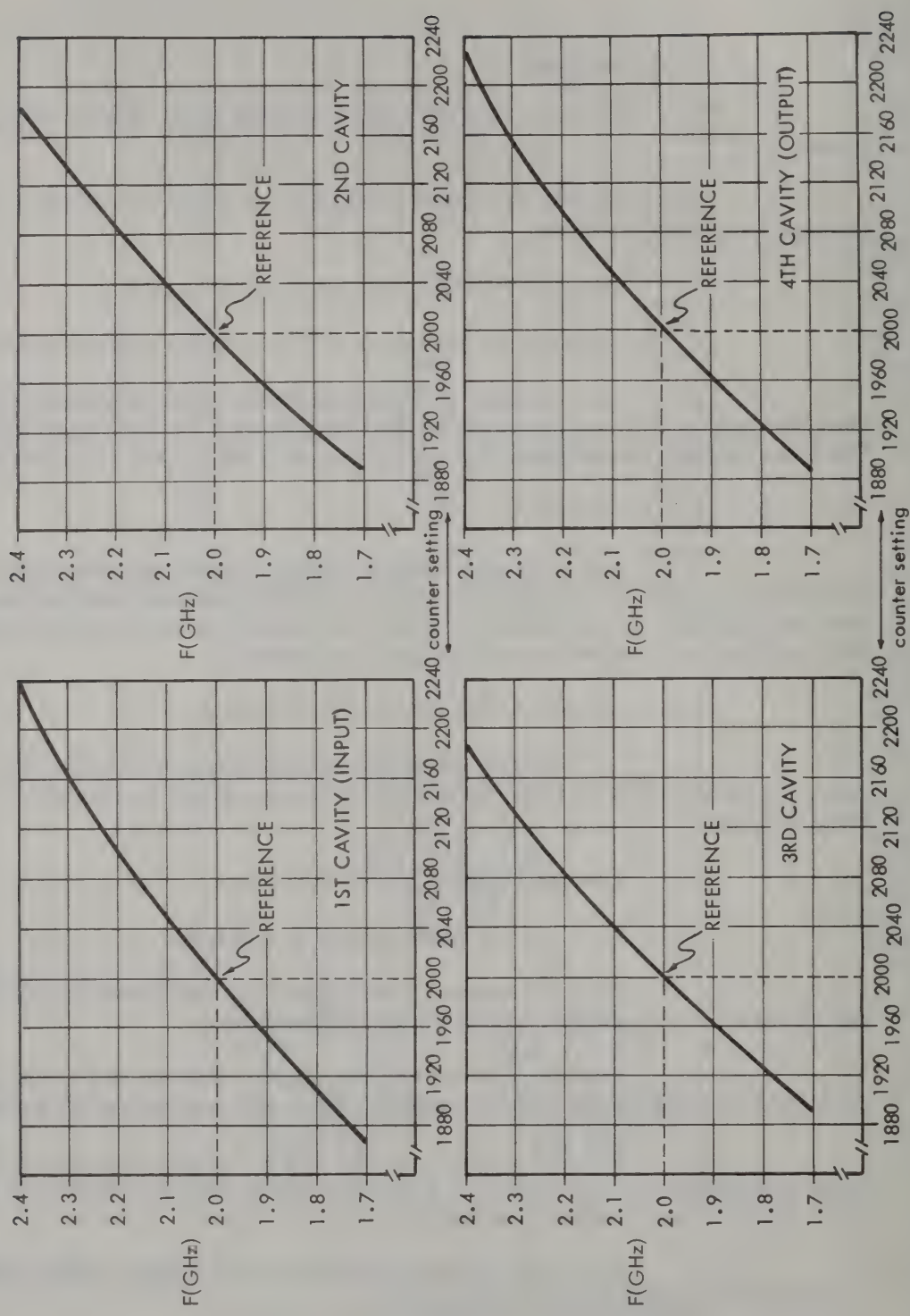
(1) Voltage reading should be 6.0 volts.

(2) If necessary, remove guard cap from FILAMENT ADJUST control and set for a reading of 6.0 volts. Replace guard cap.

d. When the filament time delay relay completes its 3 minute cycle, the FILAMENT TIME DELAY light will come on, if the door interlock switch is closed.

e. If the Beam Overload relay is in its normal, untripped, position the BEAM OVERLOAD light will come on. If this light fails to come on, operate the FAULT RESET switch to reset the Beam Overload relay.

f. If the High Reverse Power relay is in its normal, closed, position the HIGH REVERSE POWER light will come on.


2ND CAVITY
REFERENCE
1ST CAVITY (INPUT)
REFERENCE
3RD CAVITY
REFERENCE
4TH CAVITY (OUTPUT)
REFERENCE
F(GHz)
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1880
1920
1960
2000
2040
2080
2120
2160
2200
2240
counter setting

g. Close the BEAM VOLTAGE ON switch.

(1) The step-start relays will operate, the BEAM VOLTAGE light will come on and the BEAM HOURS meter will start.

CAUTION: If the step-start relays appear to operate, but the BEAM VOLTAGE light does not come on and BEAM VOLTAGE and CURRENT meters read about one-half normal, shutdown immediately. K2 is faulty (not closing) and Beam Transformer current is being carried by the step-start resistors R1, R2, R3, which are not rated for continuous duty.

(2) The BEAM CURRENT meter should read approximately 0.34 amperes and the BEAM VOLTAGE approximately 5.4 kilovolts. If the meters do not indicate, the BEAM circuit breaker may have been left in the Off position. Turn the BEAM VOLTAGE ON switch to Off before closing the circuit breaker.

4. Klystron Tuning Procedure

a. Synchronous Tuning

(1) After the Turn On procedure described above has been completed, refer to the klystron tuning charts, Figure 2-2, and set the four cavities for the desired frequency.

(2) Set the METER SENS. control for maximum sensitivity (full clockwise).

(3) Decrease the input attenuation, turn ATTENUATOR clockwise, until a good scale deflection is obtained on the TUNING meter.

(4) Adjust the INPUT CAVITY to obtain a null (dip) on the TUNING meter. Increase input attenuation to decrease drive (turn ATTENUATOR counter-clockwise) while adjusting the INPUT CAVITY until a minimum null indication is obtained. Set the INPUT CAVITY tuning to the center of this null (dip).

(5) At this point some indication of power output should be seen on the FORWARD POWER meter and tuning may proceed, as described below. If no output is seen, temporarily short the series resistor, R26, (Figure 1-2) in the meter circuit (mounted on bracket on the rear of the door near M5) with a clip lead to increase meter sensitivity, and proceed with tuning. As soon as a fair power output indication is obtained, remove the short from R26.

(6) Tune the OUTPUT CAVITY, THIRD CAVITY and SECOND CAVITY, in this order, for maximum power output.

(7) Decrease drive, turn ATTENUATOR counterclockwise, until power output is reduced to about 1/3 of previous level.

(8) Continue tuning procedure, as in (6) above, for maximum power output. When best results have been obtained, tune the INPUT CAVITY for maximum power output.

(9) Increase drive, turn ATTENUATOR clockwise, until a maximum power output point is reached. The klystron amplifier is now synchronously (sync) tuned.

b. Wide Band High Efficiency Tuning

(1) Sync tune as above.

(2) Tune the THIRD CAVITY to a higher frequency (counterclockwise rotation) until power drops off approximately 10 db (1/10 of former level).

(3) Increase drive (turn ATTENUATOR clockwise) until a maximum power output point is reached.

(4) Readjust the FOURTH, SECOND and INPUT cavities slightly to obtain maximum power output. The resonance point now will be fairly broad. The klystron amplifier is now wide band, high efficiency tuned.

5. Increased Power Output

a. Reduce drive to minimum (ATTENUATOR full counterclockwise).

b. Turn BEAM VOLTAGE ON and FILAMENT VOLTAGE ON switches to Off. Turn off power at Load Center. Set the Beam Transformer tie bars for the next highest power tap (1 kW). (Paragraph B.1.c.)

c. Turn Amplifier on (connect power at Load Center and close FILAMENT VOLTAGE ON and BEAM VOLTAGE ON switches).

(1) Adjust ATTENUATOR until a maximum power output point is reached. This will be approximately 1 kW.

(2) Carefully check tuning of cavities for maximum output.

d. Repeat steps a. through c. for the next higher (2 kW) tap setting of the Beam transformer.

e. Typical meter readings for the three power output levels are:

Beam Voltage	Beam Current	Power Output
5.4 kV	0.340 A	0.5 kW
6.5 kV	0.450 A	1.0 kW
7.8 kV	0.595 A	2.0 kW (1.7-2.0 GHz)
8.4 kV	0.650 A	2.0 kW (2.0-2.4 GHz see para. B.1.b.)

C. ROUTINE OPERATION

1. Turn On Procedure

When the klystron has been properly tuned and adjusted for the desired power output level the Amplifier may be placed on the air as follows: (circuit breakers are normally left in the On position).

a. Check to make sure the red pointer on the FORWARD POWER meter is set full counterclockwise.

b. Place FILAMENT VOLTAGE ON switch in the ON position.

c. After the time delay cycle has been completed, place the BEAM VOLTAGE ON switch in the On position.

(1) Check voltages, currents and power output for normal levels.

(2) Set red pointer on FORWARD POWER meter to power level at which remote indicator is to operate, if a remote indicator is used.

(3) Check setting of the red pointer on the REFLECTED POWER meter to see that it is set to the correct overload level, no higher than 80 watts.

d. When operating continuously on the same frequency the power level setting and the klystron tuning do not need to be readjusted except at infrequent intervals.

2. Fault Reset

a. Momentary Power Failure. In case of a power failure of up to about 5 seconds duration, the Amplifier will automatically be restored to normal operation as soon as the power comes back on. For a power failure of longer duration the Filament Time Delay cycle will have to be completed before normal output is restored. Turn the

BEAM VOLTAGE ON switch to Off while awaiting the completion of the Filament Delay cycle and then restore operation by turning On the BEAM VOLTAGE ON switch.

b. Beam Overload or Reverse Power Overload. Turn BEAM VOLTAGE ON switch to Off. Operate the FAULT RESET switch. Turn On BEAM VOLTAGE ON switch. If fault persists, take proper corrective action. See Maintenance Section.

c. Low Forward Power. To release the pointer of the FORWARD POWER meter relay, operate the FAULT RESET switch. It is not necessary to turn off the Beam Power to reset this meter relay.

d. Collector Overtemperature Switch. This switch will reclose when it cools down. Turn BEAM VOLTAGE ON switch to Off so that Beam Voltage may not be restored until trouble is located. Refer to Maintenance Section.

3. Shutdown Procedure

a. Set the red pointer on the FORWARD POWER meter to maximum counterclockwise position. (This prevents remote alarm from indicating when the Amplifier is shutdown. It also prevents the meter relay from locking in the closed position when the Amplifier is restarted.)

b. Turn BEAM VOLTAGE ON and FILAMENT VOLTAGE ON switches to the Off position.

NOTE: The CONTROL POWER indicator (neon) light will remain On as long as power is connected from the Load Center and the FILAMENT circuit breaker is closed.

4. Calibration of Forward and Reverse Power Meters

The FORWARD and REVERSE POWER meters are calibrated at 2.0 GHz when shipped from the factory. If the Amplifier is to operate on a frequency very far removed from 2.0 GHz, for best accuracy the meters should be recalibrated. See Section IV paragraph C.5.

SECTION III
THEORY OF OPERATION

A. FUNCTIONAL DESCRIPTION

RF input from a suitable source is connected to the klystron amplifier tube Input Cavity through a variable attenuator and a directional coupler. The attenuator controls input levels and the directional coupler monitors reflected power from the Input Cavity for tuning purposes. See Block Diagram, Figure 6-2. Amplified output from the klystron passes through a low-pass filter to remove undesirable harmonics and spurious radiation and through a directional coupler which monitors both Forward and Reflected Power for metering and control purposes.

The control circuits determine the order in which various functions take place. The blowers are started and normal air flow established before the filament voltage may be applied to the klystron. After the application of filament volage there is a three minute delay which allows the klystron cathode to come up to operating temperature before beam voltage may be applied.

The control circuit also protects the amplifier under abnormal conditions. After the beam voltage has been applied, excessive beam current will cause the beam voltage to be turned off, as will excessive temperature at the klystron collector. When the klystron has been tuned and is delivering power to the antenna, a condition of high reverse power will also cause the beam voltage to be turned off. A remotely located indicator (visual or audible or both) properly connected into the control circuit provided, will indicate a low forward power condition. Both the high reverse power trip point and the low forward power indicator point are adjustable with a front panel adjustment.

B. CIRCUIT DESCRIPTION

1. RF Amplifier

The 4K5SL-1 tube used in the Model 2002 is a four cavity klystron having a gain of more than 40 db. An input of approximately 500 milliwatts to the Amplifier will drive the tube to a full output of 2 kW.

Excitation is brought to the Input Cavity of the tube through the input ATTENUATOR, AT1, and the Directional Coupler, DC1. The Attenuator has a range of 0-30 db and is used to control the input excitation level to the klystron Input Cavity. The reverse power output of the Directional Coupler, DC1, is rectified by the crystal detector mounted in the output connector and this output is connected to the TUNING meter. A

potentiometer control, R27, in this circuit allows adjustment of the Tuning Meter sensitivity. When the Input Cavity is tuned to resonance, reverse power is minimum so the meter indicates resonance as a minimum reading (dip).

A 5 watt, 50 ohm load, AT2, is connected to an output of the Second Cavity. This load must be connected to the second cavity of the klystron for the tube to function properly.

When the cavities are properly tuned for either minimum drive (sync tuned) or maximum efficiency (wide band tuning), amplified output is delivered to the external antenna or load through the Harmonic Filter, FL1, and the Directional Coupler, DC2. Both the Incident and Reflected outputs of the Directional Coupler are used. Incident output is rectified by crystal detector, CR9, and connected to the FORWARD POWER meter, M5. Reflected power is rectified by CR8 and connected to the REVERSE POWER meter, M6. The coupling factor of the Incident probe in the directional coupler is 44 db while that of the Reflected probe is 34 db. These coupling factors make possible the use of the same full scale meter movement in both Forward and Reflected Power meters, since 1 kW of incident power will provide the same output to the meter as 100 watts of reflected power. This relationship is used in calibrating the REVERSE POWER meter at 100 watts when the incident power is 1 kW by interchanging the crystal detectors, CR8 and CR9, in the directional coupler.

2. Klystron Power Supplies

a. Beam Supply

The AC 208 volt three phase input is stepped up to the required 5-8 kV with a delta-wye connected three phase transformer, T1. Three taps on each primary, any one set of which may be selected, may be adjusted for line voltages of ±10% of nominal 208 volts. Four taps on each primary permit selection of amplifier power output levels. Levels that may be selected are: 0.5 kW at 5.4 kV, 1 kW at 6.5 kV and 2 kW at 7.9 kV. Since the klystron tube requires a higher beam voltage to produce full 2 kW output as the frequency approaches 2.4 Gc, an additional 2 kW tap at 8.4 kV is provided.

Secondary output of T1 is rectified with the six high voltage rectifier blocks, CR1-CR6. DC output is smoothed with the low-pass filter L1-C1 and transients are suppressed by the thyrite Varistor, RV1. Transient suppression also is provided on the primary side of the transformer by R4-C2, R5-C3, and R6-C4.

The high voltage bleeder is made up of R8-R12, and the high voltage meter multiplier of R17-R19. The resistor network R13-R16 determines the current level at which the Beam Overload relay, K4B, trips, fine adjustment being provided by R15. R7 aids in surge supression.

b. Filament Supply

The 4.5 amperes at 6 volts required by the klystron filament is supplied by filament transformer, T2. This transformer is insulated for high voltage since the klystron filament/cathode operates at up to -8.4 kV dc. Variable voltage transformer, T3, permits filament adjustment to 6 volts for other than the nominal 120/208V ac line voltage. R28 is the calibration adjustment for filament voltmeter, M1.

3. Circuit Protection and Control

a. AC Circuit Protection

The three phase input to the Beam transformer is protected by circuit breaker, CB3, and to the Collector exhaust blower by circuit breaker CB1. The two 120 volt ac single phase circuits are protected by circuit breaker, CB2, and the 120 volt ac convenience outlets by F1.

b. Control Circuits

All the control circuits operate at 120 volts ac except the meter and high reverse power relays which operate at 50 volts dc. The half wave rectifier circuit consisting of T4, CR7, R20 and C5 supplies 50 volts dc ±10% for this purpose.

Before the control circuit can be activated both circuit breakers CB1, COOLING, and CB2, FILAMENT, must be closed. To prevent the possibility of applying beam voltage to the klystron before cooling air flow has begun, an auxiliary set of contacts on the COOLING circuit breaker, CB1, which connects power to the Collector blower, and an air flow switch, S2, which is actuated by air flow through the collector assembly, both must be closed before power may be applied to the klystron.

With circuit breakers COOLING, CB1, and FILAMENT, CB2, closed, when FILAMENT VOLTAGE ON switch, S1, is turned on, power is applied to the meter relay power supply, and is also available at the FAULT RESET switch to reset Beam Overload relay, K4, if necessary. At the same time the Collector and Body exhaust blowers, B1 and B2, start, air flow switch, S2, closes and power is applied to the klystron filament supply and to the Filament Time delay relay, K7. In addition the FILAMENT VOLTAGE indicator light comes on and the FILAMENT HOURS meter starts.

After a three minute interval K7 closes and operates relay, K3. K3 locks in with a set of its own contacts, closes the control circuit with another set of contacts and opens the timing heater circuit of K7. K7 control contacts open in about 1.5 minutes as the timing heater cools down so that the relay is ready for another delay cycle shortly after the amplifier has been placed in operation. At the same time power is applied to K8 which, after a 10 second delay, closes and remains closed. The function of K8 will be described later.

After K3 closes, the door interlock, S3, must be closed before the FILAMENT TIME DELAY indicator light will come on. If K4 is in its normal, untripped, position the BEAM OVERLOAD light also will come on. High reverse power relay, K5, closes as soon as power is connected to the meter relay power supply. It will remain closed unless the REVERSE POWER meter relay closes. With K5 closed the HIGH REVERSE POWER indicator light will come on.

The BEAM VOLTAGE ON switch may now be closed and power will be applied to the step-start contactors K1 and K2 through the Collector Overtemperature switch, S6, which is normally closed.

K1 connects the three phase ac 208 volt line to the high voltage transformer, T1, through surge limiting resistors, R1, R2, R3. At the same time a set of K1 contacts closes the circuit to contactor K2. When K2 closes the surge limiting resistors are shorted out and full line voltage is applied to T1. A set of contacts on K2 also closes the circuit to the BEAM VOLTAGE indicator light, which comes on, and to the BEAM HOURS meter, which starts. At this point the klystron may be tuned for normal operation.

c. Momentary Power Failure

When power to the klystron tube is interrupted for only a short time the cathode does not cool down enough for it to be damaged if beam voltage is immediately reconnected. For this reason provision is made to re-apply beam voltage to the klystron as soon as line power comes back on if a power failure does not last more than five seconds. Thermal delay relay, K8, provides this function.

The contacts of K8 are in parallel with the hold contacts of K3. When a power failure occurs all relays open except K8, since it takes about five seconds for the heater to cool down enough to allow its contacts to open. If power is restored within this time, K3 is connected to the control circuit through K8 and closes immediately, applying power to the step-start relays through K5, which has now closed again, so that high voltage is immediately connected to the klystron. If the power failure duration is much longer than 5 seconds the contacts of K8 open and the regular three minute delay cycle of K7 must be completed before high voltage is restored to the klystron.

d. Beam Power Overload

If beam current exceeds about 0.9 amperes the voltage drop through R13, R14 causes sufficient current to flow through K4B to cause it to trip, opening the high voltage control circuit. Before K4B can be reset by operating the FAULT RESET switch, the BEAM VOLTAGE ON switch must be placed in the Off position. The trip point of K4B is adjusted with R15.

The Beam Overload circuit also provides additional protection: If the high voltage power supply should be shorted to ground or if meter, M3, should open up, or an open circuit should occur in the meter circuit, current flow through R13-R16 will

cause K4B to trip and remove the beam voltage.

e. Reverse Power Overload

Whenever reverse power from the antenna reaches the level to which the red pointer on the REVERSE POWER meter is set, the meter relay contacts close and the holding coil is energized. The meter relay is connected in parallel with the High Reverse power relay, K5. Since the resistance of the meter relay holding coil is much less than the coil of K5, most of the available current flows through the meter relay and K5 drops out. Current through this circuit is limited by R22. K5 remains open until the meter relay circuit is reset by operating the FAULT RESET switch, S5.

f. Collector Overtemperature

A thermally operated switch, S6, is screwed into a socket in the top of the klystron collector assembly. If the collector temperature rises above the trip point of 220°C due to insufficient cooling, the switch opens the high voltage control circuit and removes the Beam voltage. The switch will close again as soon as it cools down.

g. Indicator Lights

The indicator lights are placed in the control circuit both to show the status of the circuit at any time during the start-up procedure, and to give an indication of the location of the trouble in case one of the protective devices opens the circuit. The location of the trouble is indicated by the first light that is out in the sequence from left to right across the top of the cabinet door.

4. Cooling

The cooling system removes the heat generated by the klystron beam and the filament heater from the collector and body assemblies. Two exhaust blowers are used, one for the collector assembly and one for the body and cathode assembly. Air entering through the main entrance filter in the door and through a small filter in the top of the cabinet, is drawn over the heat radiating surfaces of the klystron and then exhausted to the outside atmosphere through vents in the top of the cabinet. Total required air flow is at least 325 cfm, therefore the air filters must be kept clean so that the flow may not be restircted. All other openings into the cabinet must be kept tightly ckosed to prevent unfiltered air from entering.

SECTION IV
MAINTENANCE

A. PREVENTIVE MAINTENANCE

General maintenance procedure should be carried out at regular intervals. The air filters should be replaced on a monthly basis when the Amplifier is used continuously, unless conditions warrant otherwise. The interior of the cabinet should be kpet clean and free of dust. A periodic check should be made for loose electrical connections and burned or chafed wires.

Both the Collector and Body exhaust blower motors are equipped with sealed, permanently lubricated bearings, so no lubrication is required. The oil ports on the body blower motor are not to be used.

B. TROUBLESHOOTING

1. General

As an aid in tracing trouble indicated by a light out or an improper meter reading, in addition to the use of the schematic diagram a review of the sequence of operation and circuit description as given in Sections II and III is recommended.

In the sequence of lights from left to right across the top of the cabinet door, the first light that is out indicates the general location of the trouble. Some trouble indications and possible causes are given below.

2. Trouble Indications and Possible Causes

Trouble Indication	Possible Cause
All lights on but no reading on BEAM CURRENT and BEAM VOLTAGE meters	BEAM circuit breaker Off. (Be sure to turn BEAM VOLTAGE ON switch to Off before closing circuit breaker.)
BEAM VOLTAGE light out, preceding lights on, BEAM VOLTAGE and CURRENT meters not indicating	BEAM VOLTAGE ON switch in Off position. Collector Overtemperature switch open due to excessive collector temperature, caused by insufficient air flow due to clogged air filters or blower failure.

Trouble Indication	Possible Cause
BEAM VOLTAGE light out, preceding lights on, BEAM VOLTAGE and CURRENT meters indicating about one-half normal	K2 contactor not closed due to faulty operation. Turn Off Amplifier immediately.
HIGH REVERSE POWER light out, preceding lights on	Reverse power from antenna or load greater than red pointer setting on REVERSE POWER meter. Red pointer set at too low a power level. Low output from meter relay power supply due to faulty filter capacitor or diode rectifier. Faulty meter, M6. Faulty relay, K5.
BEAM OVERLOAD light out, preceding lights on	Beam overload relay tripped by initial current surge when transformer taps set for high output power, because overload relay trip point set too close to the normal beam current. Faulty klystron tube. Short to ground in Beam Voltage supply output or klystron filament supply circuit. BEAM CURRENT meter, M3, open circuited or an open in the external meter circuit. Feedback due to improperly connected input and output RF lines causing self oscillation in the klystron tube. Faulty Beam Overload relay.
FILAMENT TIME DELAY light out, preceding lights on	Door interlock switch open. Thermal time delay relay, K7, has not yet completed its three minute cycle. Faulty K7 relay. Faulty K3 relay.
FILAMENT VOLTAGE light out, preceding light on	COOLING circuit breaker open or tripped. Air flow switch, S2, open because of insufficient air flow due to clogged air filters or faulty blower.
CONTROL POWER light out	FILAMENT circuit breaker open or tripped. No power from Load Center to the Amplifier.

Trouble Indication	Possible Cause
BEAM VOLTAGE light ON and BEAM VOLTAGE and BEAM CURRENT meters read much lower than normal for the transformer power setting in use	One or more of the high voltage rectifier blocks faulty.
BEAM circuit breaker trips but Beam Overload relay does not	Shorted filter capacitor, C1, or thyrite varistor, RV1.
Remote Low Forward power indicator comes on as soon as FILAMENT VOLTAGE ON switch is closed	Red pointer on FORWARD POWER meter not set to maximum counterclockwise position before Amplifier shutdown.

3. Voltage Chart

From	To	Volts
TB3-1 TB3-1 TB3-2	TB3-2 TB3-3 TB3-3	208 VAC 208 VAC 208 VAC
TB1-2 TB1-3 TB1-4	TB1-1 TB1-1 TB1-1	120 VAC 120 VAC 120 VAC
After CB1, CB2 and S1 closed		
TB9-1 TB9-1 TB9-2	TB9-2 TB9-3 TB9-3	208 VAC 208 VAC 208 VAC
TB8-2	TB8-1	120 VAC
TB1-1	TB1-10	120 VAC
Across C5		50 VAC
After Time Delay Relay K7 closes		
TB1-1	TB1-14	120 VAC

4. Resistance Chart

From	To	Approximate Resistance ohms
TB1-5	TB1-6	24
TB1-5	TB1-7	24
TB1-6	TB1-7	24
TB1-1	TB1-8	14
TB1-1	TB1-10	7
TB1-1	TB1-11	7
TB1-1	TB1-9	90
TB2-4	TB2-7	Zero
TB7-4	TB7-5	0.2
TB7-4	TB7-6	0.2
TB7-5	TB7-6	0.2
TB2-13	TB2-11	2.5K
TB2-13	TB2-12	9K
TB1-1	TB2-14	1K
TB1-1	TB1-15	90
TB1-1	K8, pin 3 (org. Wire)	400
TB1-1	K2 (vio.Wire)	17
TB6-14	TB6-15	18
Across RV1		190K

C. ADJUSTMENTS

1. Test Equipment Required

The equivalent of the following recommended equipment may be used.

Multimeter	Weston 980
DC Power Supply	Power Designs Model 1515A
Termination Load	Bird Model 8890
Dual Water Load	Sierra Model 286B
Calorimeter Test Set	Sierra Model 290C
Calorimeter	HP Model 434A
Stub Tuner	Narda Model 908N

2. Filament Voltage Meter

a. Connect an accurate AC Voltmeter (multimeter) across the secondary terminals of the filament transformer, T2, Figure 1-2.

b. Close the FILAMENT and COOLING circuit breakers. Be sure the BEAM circuit breaker is left open.

c. Close the FILAMENT VOLTAGE ON switch.

d. Remove the guard nut and turn the FILAMENT ADJUST control, T3, until the AC voltmeter reads 6.0 volts. Replace guard nut.

e. Adjust R28 until FILAMENT VOLTAGE meter reads 6.0 volts. Tighten lock nut on control.

f. Open FILAMENT and COOLING circuit breakers and remove the AC meter from T2.

3. Filament Time Delay Relays

a. Close COOLING and FILAMENT circuit breakers and FILAMENT VOLTAGE ON switch.

b. Three minutes after the FILAMENT VOLTAGE light comes on, the FILAMENT TIME DELAY light should come on.

c. If the time is less than three minutes, K7 must be readjusted. Turn screw in top of relay counterclockwise to increase time. Recheck time.

d. After FILAMENT TIME DELAY light has been on for at least three minutes, turn FILAMENT VOLTAGE ON switch to Off and after no more than five seconds turn it On again.

e. FILAMENT TIME DELAY light should come on immediately after turning switch back on, through the closed contact of K8. If FILAMENT TIME DELAY light does not come on, K8 may be defective.

4. Beam Overload Relay

a. Short jumper the high voltage bleeder resistors, R8-R12.

b. Connect the DC Power Supply negative terminal to the klystron cathode and the positive terminal to ground.

c. Increase the power supply voltage until the BEAM CURRENT meter reads 0.9 amperes.

d. Close FILAMENT and COOLING circuit breakers and FILAMENT VOLTAGE ON switch. Close door interlock switch and wait for FILAMENT TIME DELAY light to come on.

e. Adjust R15 (through hole in lower right-hand front of cabinet) until K4 just energizes, BEAM OVERLOAD light goes out. Loosen lock nut to make adjustment and tighten when adjustment is completed.

f. Open circuit breakers and remove DC power supply.

5. Forward and Reverse Power Meters

a. Connect Dual Coaxial Water Load to the RF output of the Amplifier and connect Calorimeter Test Set to the Water Load. Adjust Calorimeter for measurement of 1 KW of RF power.

b. Adjust RF Exciter input to approximately 2.0 GHz (if amplifier is ordinarily used at some particular frequency, calibration should be carried out at that frequency). Adjust input drive to about 0.5 watts.

c. Set red pointer on REVERSE POWER meter full clockwise and on FORWARD POWER meter full counterclockwise.

d. Set the Beam Transformer taps for 500 watts power output (Section II, paragraph B.1.a.-c.). Turn on the Amplifier and adjust the klystron for wideband high efficiency tuning at the operating frequency. (See Section II, Turn On and Klystron Tuning Procedure).

e. Turn off Amplifier and reset the Beam Transformer taps for 1 kW output. Turn on the Amplifier and adjust tuning slightly for maximum output (Section II Klystron Tuning Procedure). Adjust for 1 kW output as indicated by the Model 290 Calorimeter. Adjust the METER CAL control, R24, until the FORWARD POWER meter reads 1 kW. (This is a preliminary adjustment.)

f. Disconnect the Forward Power Detector, CR9, from the Directional Coupler and connect in its place the Model 434A Calorimeter with the Model 908N Stub Tuner. Use an RG9/U coaxial cable not more than 12 inches in length. (The Calorimeter may be set on top of the Amplifier and the cable brought in through the AC entrance opening.) Adjust the Amplifier output until the Model 290 Calorimeter reads exactly 1 kW. Tune the Stub Tuner for maximum indication on the Model 434A Calorimeter and record the reading. (Reading will be approximately 35 mW.)

g. Turn off the Amplifier and set the Beam Transformer taps for 2 kW output. Disconnect the 286B Dual Water Load from the amplifier output and connect the Model 8890 Termination Load in its place.

h. Turn on the Amplifier and adjust the tuning slightly for maximum output. The Forward Power Detector should be reconnected for a tuning indicator. Reconnect the 434A Calorimeter as in step f. above. Adjust the Amplifier power output until the Model 434A Calorimeter reads exactly two times the reading recorded in step f. (will be approximately 70 mW). Leave power output set at this level and reconnect the Forward Power Detector, CR9, in place of the Calorimeter. Adjust the METER CAL control, R24, until the FORWARD POWER meter reads 2 kW.

i. Interchange the Forward and Reverse Power Detectors, CR9 and CR8, (do not change the power setting of the Amplifier) and adjust the METER CAL control, R23, until the REVERSE POWER meter reads 200 watts. Replace CR9 and CR8 in their proper connectors in the Directional Coupler.

SECTION V

FIGURE IDENTIFICATION TABLES

Table 5-1. Model 2002 2 KW Klystron Amplifier Assembly (figures 5-1A, 5-1B and 5-1C)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
1		CABINET DOOR ASSEMBLY (See Table 5-1A)						
2		KLYSTRON TUBE and MOUNTING SHELF ASSEMBLY (See Table 5-1B)						
3		RELAY PANEL ASSEMBLY (See Table 5-1C)						
4		HIGH VOLTAGE POWER SUPPLY CHASSIS ASSEMBLY (See Table 5-1D)						
5		RECTIFIER STACK ASSEMBLY (See Table 5-1E)						
6		SUPPRESSOR BOARD ASSEMBLY (See Table 5-1F)						
7		COLLECTOR EXHAUST BLOWER CHASSIS ASSEMBLY (See Table 5-1G)						
8		COAXIAL LINE ASSEMBLY (See Table 5-1H)						
9	B2	BLOWER, Centrifugal, 115V, 50/60 cps, 60 cfm at 0.9 inches of water static pressure. CCW Assembly, CW Motor, outlet position D, Fungus Proof	B02318800	Ripley Co.	82742	L-R Blower BV-3800		1
10	C1	CAPACITOR, Paper, 1 μF, 10K VDC with 2 footed brackets (CP072FJ9)	901250105	Gen. Electric	99142	23F1150G102		1
11	CR8	DETECTOR, Crystal Diode	910500029	Hewlett Packard	28480	420A		2
12	CR9	Same as CR8						
13	J3	CONNECTOR, Jack, Type N, P/O Cable Assembly W2	914600056	Amphenol	02660	UG23B/U		1
14	L1	INDUCTOR, Filter, 5 Henry, 0.9A	909200041	Hill Magnetic	05310			1

Table 5-1 (continued)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
15	P4	CONNECTOR, Plug, Type BNC	914600007	Amphenol	2660	UG88/U		2
16	P5	Same as P4						
17	S3	SWITCH, Interlock, SPDT	911400004	Micro Switch	40931	2AC6		1
18	T1	TRANSFORMER, Beam Supply, 3 Phase, Delta-Wye Primary: 208V, 47 to 63 cps Secondary: 5.4KV to 8.4KV	910000084	Hill Magnetic	05310			1
19	T2	TRANSFORMER, Filament Supply Primary: 120V, 50/60 cps, Single Phase Secondary: 6.0V @ 4.5A	910000083	Hill Magnetic	05310			1
20	TB8	TERMINAL BLOCK, 3 Terminals, with marker strip, Fungus Proof	919100079	Kulka	75382	600AC		2
21	TB10	Same as TB8						
22	W2	CABLE, RG9B/U, 65.000 LG., Connectors: UG-23B/U and 82-835	SU-15915-2-4	Sierra	94668			1
23		HOSE, 4 I.D., Flexible, 9.5 Lg.		Flexaust		Type CWC		1
24		HOSE, 4 I.D., Flexible, 24 Lg.		Flexaust		Type CWC		1
25		HOSE, 5½ I.D., Flexible, 19 Lg.		Flexaust		Type CWC		1
26		HOSE, 6 I.D., Flexible, 21 Lg.		Flexaust		Type CWC		1

Figure 5-1B. Cabinet Interior Rear Component Location

Figure 5-1A. Cabinet Interior Front Component Location (right side panel removed)

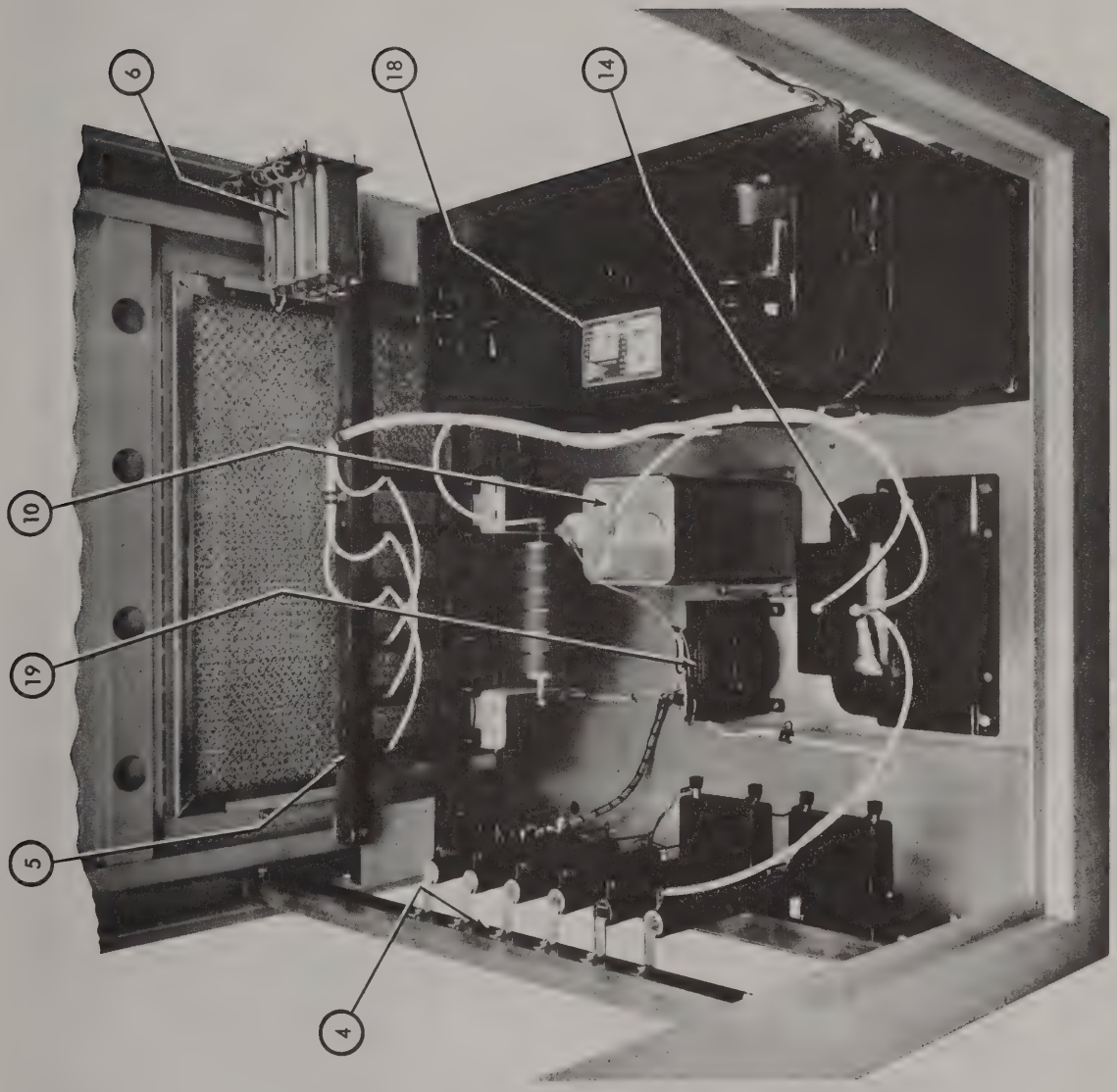


Figure 5-1C. Lower Cabinet Component Location (side panels removed)

Table 5-1A. Cabinet Door Assembly (figure 5-2)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
1	AT1	ATTENUATOR, Variable, 0-30 db, 50 ohm, 4W, Type N Connector	912100010	Merrimac	12457	AU26A		1
2	CB1	CIRCUIT BREAKER, 3 pole, 4A, 250V, 50/60 cps, Curve 4, Auxilary Contact, Fungus Proof	912500012	Heinemann	74193	AM33HKMG64		1
3	CB2	CIRCUIT BREAKER, 2 pole, 2A, 250V, 50/60 cps, Curve 4, Fungus Proof	912500013	Heinemann	74193	AM33MG62		1
4	CB3	CIRCUIT BREAKER, 3 pole, 30A, 250V, 50/60 cps, Curve 4, Fungus Proof	912500014	Heinemann	74193	AM33MG630		1
5	DC1	DIRECTIONAL COUPLER, Coupling Factor: 35 db, Directivity: 20 db, Range: 0-1.2W	911600002	Microwave Devices	82144	Micromatch 593.25		1
6	DS1	INDICATOR ASSEMBLY, 115V, 33K ohms, Internal Resistance, Amber Cap, with NE51H Neon Lamp	914200024	Dialco	72619	95408H-933		6
7	DS2	Same as DS1						
8	DS3	Same as DS1						
9	DS4	Same as DS1						
10	DS5	Same as DS1						
11	DS6	Same as DS1						
12	M1	METER, Filament Voltage, 0-100VAC, Calibrated for Non-Magnetic Panel, Fungus Proof, Scale: 0-7.5VAC per Sierra SS-15922-1	911800105	Weston	65092	Model 304		1
13	M2	METER, Beam Voltage, 0-1 milliamp DC, Calibrated for Non-Magnetic Panel, Fungus Proof, Scale: 0-10KV DC per Sierra A02245800	911800103	Weston	65092	Model 301		1

Table 5-1A (continued)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
14	M3	METER, Beam Current, 0-1ADC, Calibrated for Non-Magnetic Panel, Fungus Proof, Scale: 0-1 Amp DC, per Sierra A02245700	911800102	Weston	65092	Model 301		1
15	M4	METER, Filament Hours, Elapsed Time, Range: 9999.9 Hours, 120 VAC, 60 cps, Fungus Proof	911800077	Simpson	55026	55ET		2
16	M5	METER RELAY, Forward Power, 0-500 microamp DC, Calibrated for Non-Magnetic Panel, Fungus Proof, Low Limit Adjustable Single Contact Isolated Locking Coil: 10-25 milliamp Scale: 0-3 KW per Sierra A0224600	912600044	Assembly Prods.	80145	355C		1
17	M6	METER RELAY, Reverse Power, 0-500 Microamp DC, Calibrated for Non-Magnetic Panel, Fungus Proof, High Limit Adjustable Single Contact, Isolated Locking Coil: 10-25 Milliamp, Scale: 0-300W per Sierra A02245900	912600045	Assembly Prods.	80145	355C		1
18	M7	Same as M4 (Beam Hours)						
19	M8	METER, Tuning, 0-25 Microamp, Calibrated for Non-Magnetic Panel, Fungus Proof, Scale: 0-25 Microamp per Sierra A01592800	911800075	Weston	65092	Model 306		1
20	P2	CONNECTOR, Angle Plug, Type N, (P/O Cable Assembly W2, see Table 5-1)	914600046	Amphenol	02660	82-835		1
21	P3	CONNECTOR, Plug, BNC, P/O DC1	914600007	Amphenol	02660	UG88/U		1
22	R23	RESISTOR, Potentiometer, 500 ohm, 2W, Slotted Shaft, Locking Bushing	907900220	Ohmite	03615	CLU5011		2
23	R24	Same as R23						
24	R25	RESISTOR, Fixed Comp., 1K ohm, ±10%, 1/2 W	905200102	Allen Bradley	01121			2
25	R26	Same as R25						
26	R27	RESISTOR, Potentiometer, 25K ohm, 2W	907900221	Ohmite	03615	CU2531		1

Table 5-1A (continued)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
27	R28	RESISTOR, Potentiometer, 7.5K ohm, 2W, Slotted Shaft, Locking Bushing	907900222	Ohmite	03615	CLU7521		1
28	S1	SWITCH, Toggle, 4PST, ON-NONE-ON	911000037	Cutler Hammer	15605	7660		1
29	S4	SWITCH, Toggle, DPDT, ON-NONE-ON	911000014	Cutler Hammer	15605	8824K8		1
30	S5	SWITCH, Toggle, DPDT, ON-NONE-MOM.ON	911000025	Cutler Hammer	15605	8830K10		1
31	T3	TRANSFORMER, Variable, 120V, 50/60 cps, Fungus Proof	910000085	Superior	58474	10B S36000		1
32	TB1	TERMINAL BLOCK, 20 Terminals with marker strip, Fungus Proof	919100074	Kulka	75382	600 AC		1
33	TB2	TERMINAL BLOCK, 14 Terminals with marker strip, Fungus Proof	910000075	Kulka	75382	600 AC		1
34	TB3	TERMINAL BLOCK, 6 Terminals with marker strip, Fungus Proof	919100076	Kulka	75382	602C		1
35		FILTER, Air, 20 X 16 X 1		Research Prods.	82866	#914		1

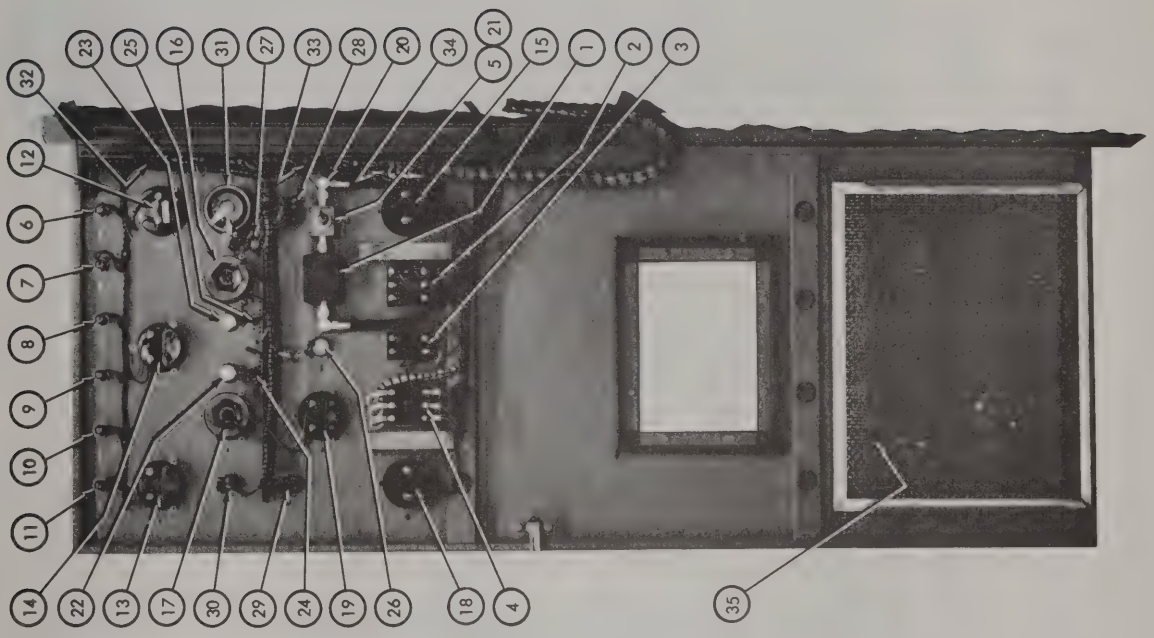


Figure 5-2. Cabinet Door Component Location

Table 5-1B. Klystron Tube and Mounting Shelf Assembly (figures 5-3A and 5-3B)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
1	AT2	TERMINATION LOAD, 50 ohm, 5W	SA0601603	Sierra	94668	160-5FN		1
2	S6	SWITCH, Thermal, SPST, 220°C	911000038	Klixon	78043	MI-420-350 -122		1
3	V1	AMPLIFIER, Klystron, CW	910700111	Eimac	72092	4K5SL-1		1
4		COUNTER, Small Square Case, #4 Rotation, 5 Figures	919600039	Veeder Root	62869	A-114145		2
5		COUNTER, Small Square Case, #1 Rotation, 5 Figures	919600038	Veeder Root	62869	A-114115		2
6		GEAR, Bevel, Modified	B02290100	Sierra	94668			4
7		PINION, Bevel	B02290200	Sierra	94668			4
8		KNOB, Spinner	916000066	Jan Hardware	99813	K1275		4

Figure 5-3B. Klystron Tuning Counter Gear Drive Component Location

Figure 5-3A. Klystron Tube and Mounting Shelf Component Location

Table 5-1C. Relay Panel Assembly (figure 5-4)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
1	C5	CAPACITOR, Electrolytic, 12 Microfarad, 350VDC	901200126	Aerovox	97262	BT350		1
2	CR7	RECTIFIER, Silicon, 1A, 300V PRV	910800016	General Elec.,	99142	A13C2		1
3	F1	FUSE, 15A, 250V, Ceramic Tube, 1/4 X 1-1/4	913200037	Buss	10133	ABC15		2
4	F2	Same as F1 (Spare)						
5	J1	RECEPTACLE, Duplex	914800064	Graybar	26042	1543GL		1
6	J2	CONNECTOR, Jack, Type N (P/O W1)	914600037	Amphenol	02660	UG22B/U		1
7	K1	CONTACTOR, Size 00, 3 pole plus auxiliary contact, Coil: 115V, 50/60 cps, Open Type, Fungus Proof	912600047	Square D	05441	8502-A2-2		1
8	K2	CONTACTOR, Size 1, 3 pole plus auxiliary contact, Coil: 115V, 50/60 cps, Open Type, Fungus Proof	912600039	Square D	05541	8502-C0-2		1
9	K3	RELAY, DPDT, Left Pile-up (1) Form C, Right Pile-up (1) Form D, Coil: 115V, 50/60 cps; Fungus Proof	912600043	Automatic Electric	04777	Series EFA		1
10	K4	RELAY, Latching, 4PDT, Latching Coil: 6VDC, 26 ohms; Pullin: 80% of nominal V; Reset Coil: 115VAC, Fungus Proof	912600048	Ohmite	03615	GPRLEX		1
11	K5	RELAY, Sensitive, SPDT, 5A; Coil: 2.5K ohm;Pull-in: 7.2 milliamp; Fungus Proof	912600049	Ohmite	03615	GPRX82T		1
12	K6	RELAY, Sensitive, DPDT, 5A; Coil: 2.5K ohm; Pull-in: 10 milliamp; Fungus Proof	912600035	Ohmite	03615	GPRX83T		1
13	K7	RELAY, Thermal Time Delay, SPST, 115V Heater, 3A Contacts Normally Open, 180 sec. Delay	912800009	G.V. Controls	93929	R0160		1
14	K8	RELAY, Thermal Time Delay, SPST, 115V Heater, 3A,Contacts Normally Open, 10 sec. Delay	912800011	Amperite	70563	115N010		1

Table 5-1C (continued)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
15	P1	CONNECTOR, Angle Plug, Type N, (P/O W1)	914600046	Amphenol	02660	82-835		1
16	R1	RESISTOR, Fixed, WW, 10 ohm ±5%, 50W	906810100	Ohmite	03615	0400B		3
17	R2	Same as R1						
18	R3	Same as R1						
19	R20	RESISTOR, Fixed, Comp., 10 ohm ±10%, 1W	905600100	Allen Bradley	01121			1
20	R21	RESISTOR, Fixed, Comp., 1.5K ohm ±5%, 2W	905800152	Allen Bradley	01121			1
21	R22	RESISTOR, Fixed, Comp., 2.7K ohm ±5%, 2W	905800272	Allen Bradley	01121			1
22	T4	TRANSFORMER, Alarm Supply, Primary: 117V, 47 to 63 cps Secondary: 45VDC @25 milliamp and 55VDC @ 10 milliamp per Sierra A02244700	910000075	Hill Magnetics	05310			1
23	TB4	TERMINAL BLOCK, 4 terminals, with marker strip, Fungus Proof	919100077	Kulka	75382	605C		1
24	TB5	TERMINAL BLOCK, 10 terminals, with marker strip, Fungus Proof	919100078	Kulka	75382	601C		1
25	TB6	TERMINAL BLOCK, 20 terminals, with marker strip, Fungus Proof	910000084	Kulka	75382	600AC		1
26	TB7	TERMINAL BLOCK, 6 terminal, with marker strip, Fungus Proof	910000076	Kulka	75382	602C		1
27	W1	CABLE ASSEMBLY, RG9B/U, 58.500 Lg., Connectors: UG-22B/U and 82-835	SU15915 -2-2	Sierra	94668	SU-15915-2-2		1

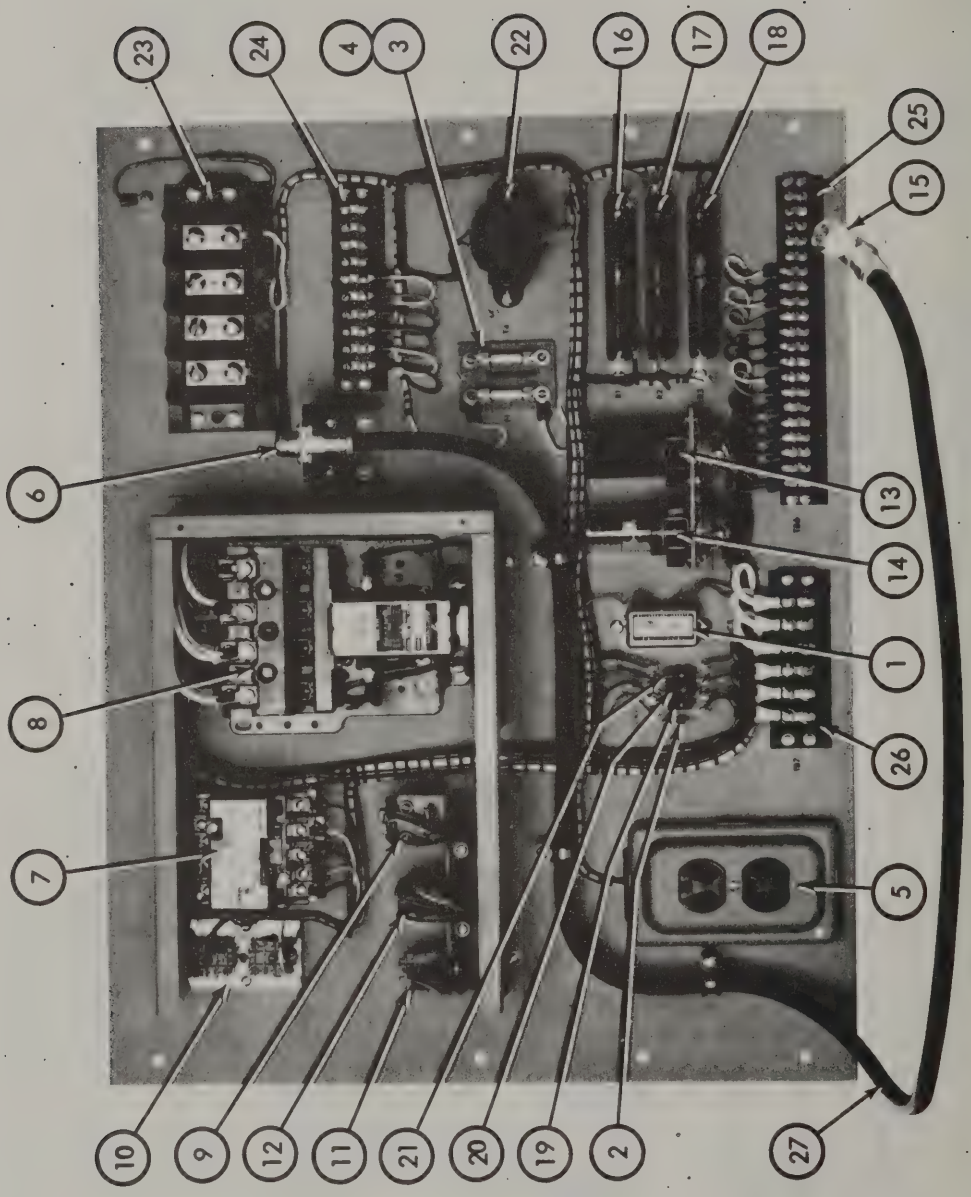


Figure 5-4. Relay Panel Component Location

Table 5-1D. High Voltage Power Supply Chassis Assembly (figure 5-5)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
1	R7	RESISTOR, Fixed, WW, 50 ohm ±5%, 100W	906800500	Ohmite	03615	0602		1
2	R8	RESISTOR, Fixed, WW, 40K ohm ±5%, 100W	906800403	Ohmite	03615	0621		5
3	R9	Same as R8						
4	R10	Same as R8						
5	R11	Same as R8						
6	R12	Same as R8						
7	R13	RESISTOR, Flat, Fixed, WW, 25 ohm ±5%, 20W	906600250	Ohmite	03615	F206		2
8	R14	Same as R13						
9	R15	RESISTOR, Rheostat, 75 ohm, 12½W, Slotted Shaft, Locking Bushing	908000750	Ohmite	03615	E-75-L0-1		1
10	R16	RESISTOR, Flat, Fixed WW, 6K ohm ±5%, 20W	906600602	Ohmite	03615	F227		1
11	R17	RESISTOR, Meter Multiplier, 5 megohm	905100002	Simpson	55026	183		2
12	R18	Same as R17						
13	R19	RESISTOR, Fixed, Comp., 100K ohm ±10%, 2W	906000104	Allen Bradley	01121			1

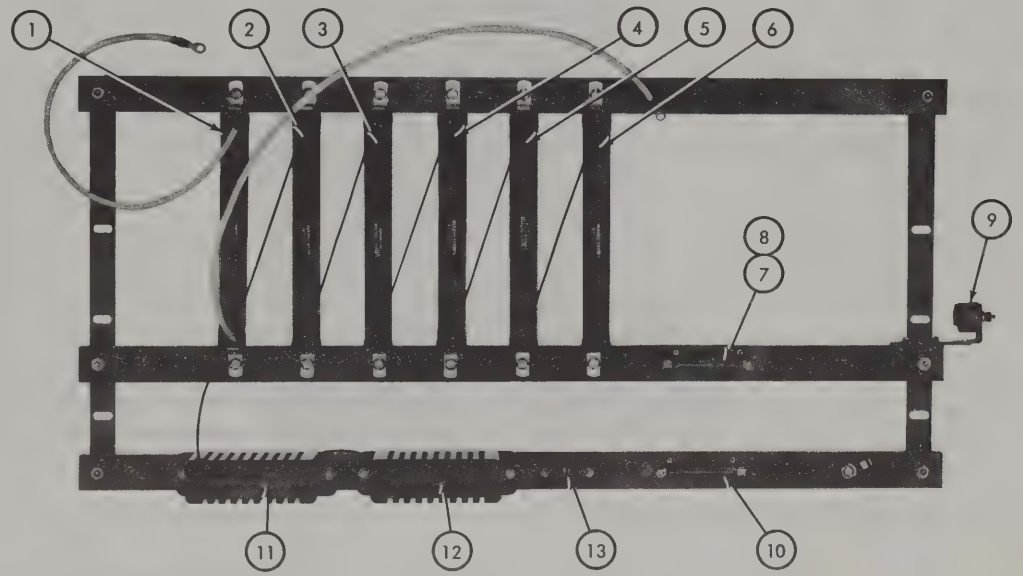


Figure 5-5. High Voltage Power Supply Chassis Component Location

Table 5-1E. Rectifier Stack Assembly (figure 5-6)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
1	CR1	RECTIFIER, 3 Phase, Full Wave Bridge, 9400VDC, 2.25A @ 25°C, PIV per Leg: 20 KV	910800015	Solitron	13327	TBF200		1
2	CR2	P/O CR1						
3	CR3	P/O CR1						
4	CR4	P/O CR1						
5	CR5	P/O CR1						
6	CR6	P/O CR1						
7	RV1	RESISTOR, Thyrite, 9KV DC, 21W	908200004	General Elec.	99142	9RV3A56		1

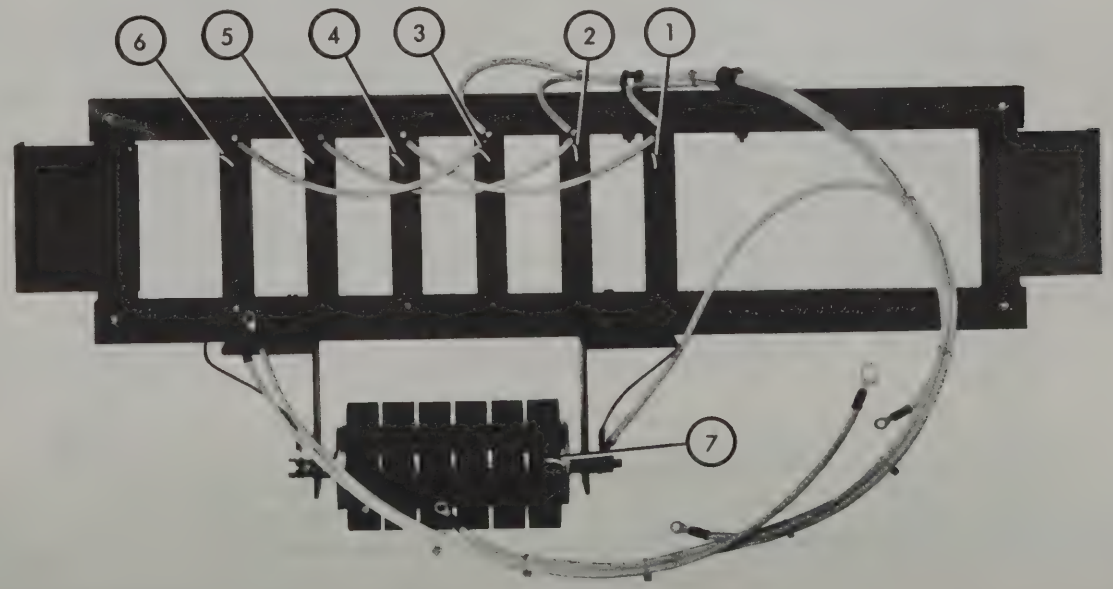


Figure 5-6. Rectifier Stack Component Location

Table 5-1F. Suppressor Board Assembly (figure 5-7)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
1	C2	CAPACITOR, Paper, 3 microfarad, 330VAC	901210305	General Elec.	99142	23F1010G103		3
2	C3	Same as C2						
3	C4	Same as C2						
4	R4	RESISTOR, Fixed, Flat, WW, 100 ohm, ±5%, 10W	906400101	Ohmite	03615	F113		3
5	R5	Same as R4						
6	R6	Same as R4						

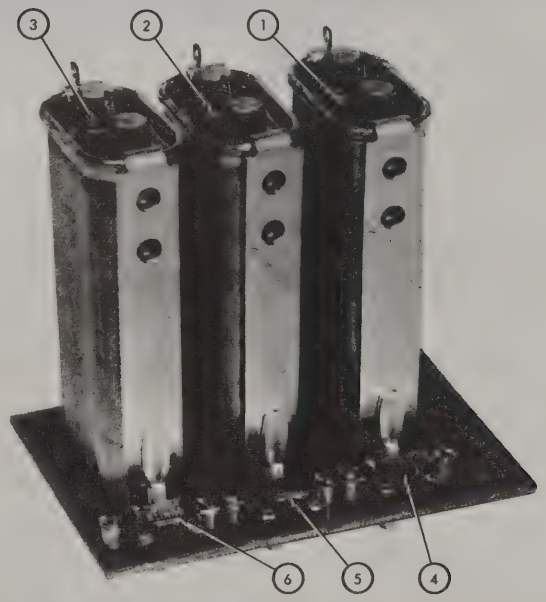


Figure 5-7. Suppressor Board Component Location

Table 5-1G. Collector Exhaust Blower Chassis Assembly (figure 5-8)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
1	B1	BLOWER, Centrifugal, 208V, 3 phase, 50/60 cps, 400 cfm at 2.3 inches of Water static pressure	917200015	Rotron	82877	CXH33A33		1
2	S2	SWITCH, Air Flow, W/Vane 1600	911400019	Rotron	82877	Model 2A		1
3	TB9	TERMINAL BLOCK, 3 Terminals, with marker strip, Fungus Proof	919100079	Kulka	75382	600AC		1

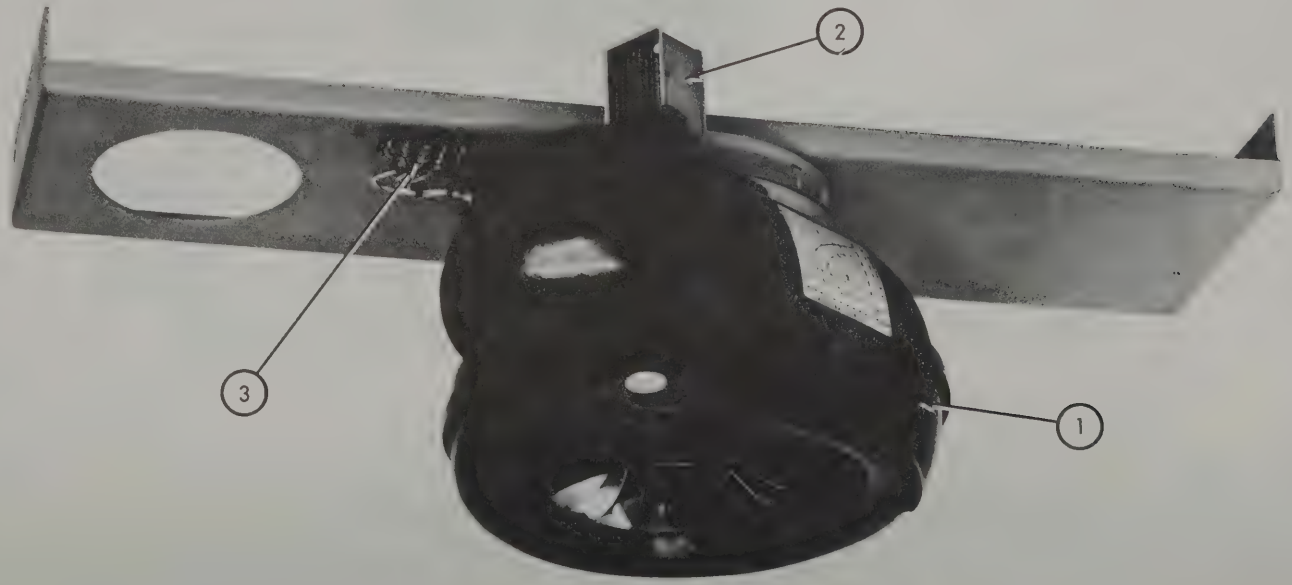


Table 5-1H. Coaxial Line Assembly (figure 5-9)

ITEM NO.	SCHEM. REF. DESIG.	DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR'S FED. CODE	MFR. NO.	FED. STOCK NO.	QUAN PER UNIT
1	DC2	DIRECTIONAL COUPLER, Frequency Range: 1.7 to 2.4 GC Coupling Factor: 44 db Incident 34 db Reflected Directivity: 30 db per Sierra A02244600	911600003	Microwave Devices	82144			1
2	FL1	FILTER, Low Pass, 2.5KW CW Pass Band: 1.7 to 2.4 GC Insertion Loss 0.5 db VSWR: 1.35 Attenuation: 50 db Second Harm. 40 db Third Harm. 30 db Fourth Harm. per Sierra A02244800	910100021	Merrimac	12457			1
3	W3	ELBOW, Miter, W/Swivel Flanges, 50 ohms, 1-5/8 Line	917100030	Andrew	04147	1061M		1
4	W4	FLEX SECTION, Coaxial, 10", 50 ohm, 1-5/8 Line	917100029	Andrew	04147	20695		1
5		CONDUCTOR, Inner Bullet	917100031	Andrew	04147	15069		5
6		O-RING	911500054	Andrew	04147	10683-2		5

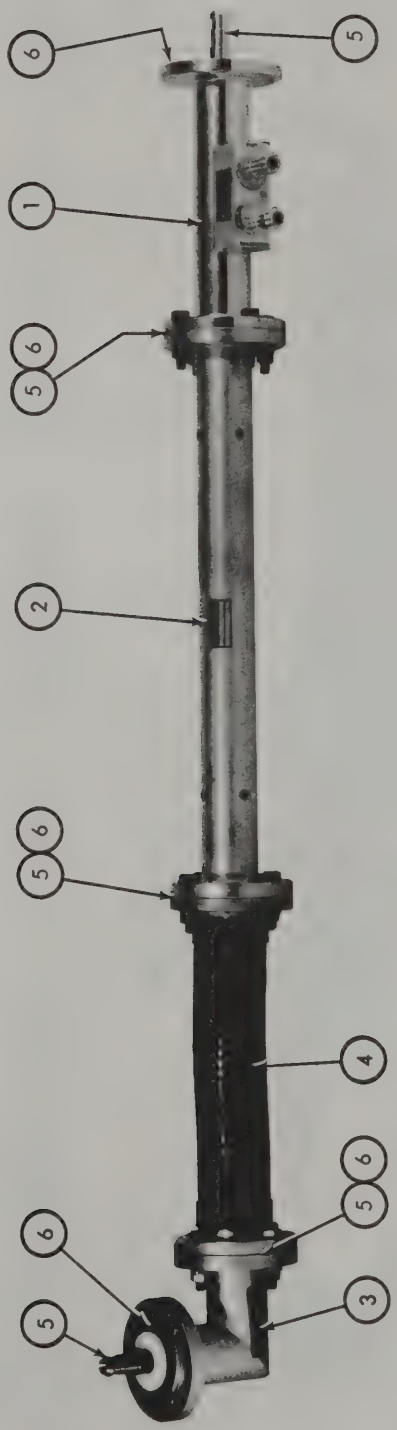


Figure 5-9. Coax Line Component Location.

Table 5-2. Parts Reference List

SCHEM DESIG	DESCRIPTION	REFERENCE	
		TABLE	ITEM
AT1	ATTENUATOR, Variable, 0-30 db, 50 ohm, 4W, Type N Connector	5-1A	1
AT2	TERMINATION LOAD, 50 ohm, 5W	5-1B	1
B1	BLOWER, Centrifugal, 3 ph, 50/60 cps, 400 cfm at 2.3 inches water static press.	5-1G	1
B2	BLOWER, Centrifugal, 115V, 50/60 cps, 60 cfm at 0.9 inches water static press., CCW Assembly, CW Motor, Outlet Position D, Fungus Proof	5-1	9
C1	CAPACITOR, Paper, 1μF, 10K VDC with two footed brackets (CP 072 FJ9)	5-1	10
C2	CAPACITOR, Paper, 3 μF, 330VAC with two spade lugs (CP 072 SA5)	5-1F	1
C3	Same as C2	5-1F	2
C4	Same as C2	5-1F	3
C5	CAPACITOR, Electrolytic, 12μF, 350VDC	5-1C	1
CB1	CIRCUIT BREAKER, 3 Pole, 4 A, 250V, 50/60 cps, Curve 4, Aux. Cont., Fungus Prf	5-1A	2
CB2	CIRCUIT BREAKER, 2 Pole, 2 A, 250V, 50/60 cps, Curve 4, Fungus Proof	5-1A	3
CB3	CIRCUIT BREAKER, 3 Pole, 30A, 250V, 50/60 cps, Curve 4, Fungus Proof	5-1A	4
CR1	RECTIFIER, 3 phase, Full Wave Bridge, 9400 VDC, 2.5 A at 25°C, PIV per leg: 20KV	5-1E	1
CR2	Part of CR1	5-1E	2
CR3	Part of CR1	5-1E	3
CR4	Part of CR1	5-1E	4
CR5	Part of CR1	5-1E	5
CR6	Part of CR1	5-1E	6
CR7	RECTIFIER, Silicon, 1A, 300V PRV	5-1C	2
CR8	DETECTOR, Crystal Diode	5-1	11
CR9	Same as CR8	5-1	12
DC1	DIRECTIONAL COUPLER, 0 to 1.2 W, Type N Connectors	5-1A	5
DC2	DIRECTIONAL COUPLER, 1.7 to 2.4 GC	5-1H	1
DS1	INDICATOR ASSEMBLY, 115V, Amber Cap, 33 ohm internal resistance with NE51H Lamp	5-1A	6
DS2	Same as DS1	5-1A	7
DS3	Same as DS1	5-1A	8
DS4	Same as DS1	5-1A	9
DS5	Same as DS1	5-1A	10
DS6	Same as DS1	5-1A	11
F1	FUSE, 15A, 250V, Ceramic Tube 1/4 x 1-1/4	5-1C	3
F2	Same as F1 (spare)	5-1C	4
FL1	FILTER, Low Pass, 2.5 KW CW	5-1H	2
J1	RECEPTACLE, Duplex	5-1C	5
J2	CONNECTOR, Jack, Type N	5-1C	6
J3	CONNECTOR, Jack, Type N	5-1	13
K1	CONTACTOR, Size 00, 3 Pole plus aux. cont., Coil: 115V, 50/60 cps, Open Type, Fungus Proof	5-1C	7
K2	CONTACTOR, Size 1, 3 Pole plus aux. cont., Coil: 115V, 50/60 cps, Open Type, Fungus Proof	5-1C	8
K3	RELAY, DPDT, Left pile-up (1): Form C, Right pile-up (1): FormD, Coil: 115V, 50/60 cps, Fungus Proof	5-1C	9
K4	RELAY, Latching, 4PDT, Latching Coil: 6VDC, 26 ohm, Pull-in: 80% Nom. V, Reset coil: 115VAC, Fungus Proof	5-1C	10
K5	RELAY, Sensitive, SPDT, 5A, Coil: 2.5K ohm, Pull-in: 7.2 ma, Fungus Proof	5-1C	11
K6	RELAY, Sensitive, DPDT, 5A, Coil: 2.5K ohm, Pull-in: 10 ma, Fungus Proof	5-1C	12
K7	RELAY, Thermal Time Delay, SPST, Contacts NO, 3A, 115V Heater, 180 sec Delay	5-1C	13
K8	RELAY, Thermal Time Delay, SPST, Contacts NO, 3A, 115V Heater, 10 sec Delay	5-1C	14

Table 5-2 (continued)

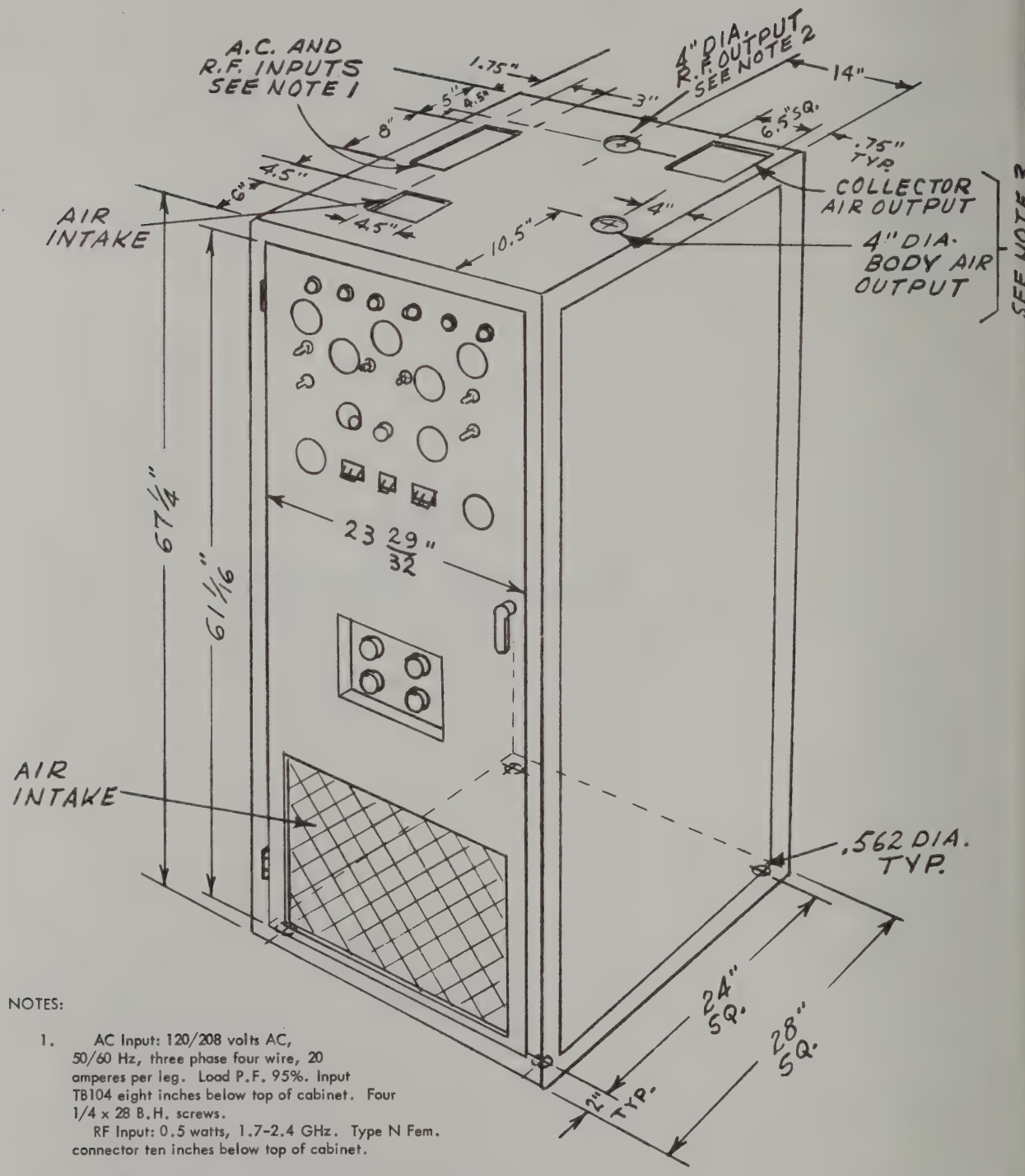
SCHEM DESIG	DESCRIPTION	REFERENCE TABLE	REFERENCE ITEM
L1	INDUCTOR, Filter, 5 H, 0.9A	5-1	14
M1	METER, Filament Voltage, 0-100 VAC, Scale: 0-75 VAC	5-1A	12
M2	METER, Beam Voltage, 0-1 ma DC, Scale: 0-10K VDC	5-1A	13
M3	METER, Beam Current, 0-1A DC, Scale: 0-1 A DC	5-1A	14
M4	METER, Filament Hours, Elapsed Time, Range: 9999.9 Hours, 120V AC, 60 cps	5-1A	15
M5	METER RELAY, Forward Power, 0-500 μa DC, Scale: 0-3 KW	5-1A	16
M6	METER RELAY, Reverse Power, 0-500 μa DC, Scale: 0-300W	5-1A	17
M7	Same as M4 (Beam Hours)	5-1A	18
M8	METER, Tuning, 0-25 μa, Scale: 0-25 μa	5-1A	19
P1	CONNECTOR, Angle Plug, Type N	5-1C	15
P2	Same as P1	5-1A	20
P3	CONNECTOR, Plug, BNC	5-1A	21
P4	Same as P3	5-1	15
P5	Same as P3	5-1	16
R1	RESISTOR, Fixed, WW, 10 ohm ±5%, 50W	5-1C	16
R2	Same as R1	5-1C	17
R3	Same as R1	5-1C	18
R4	RESISTOR, Fixed, WW, 100 ohm ±5%, 10W	5-1F	4
R5	Same as R4	5-1F	5
R6	Same as R4	5-1F	6
R7	RESISTOR, Fixed, WW, 50 ohm ±5%, 100W	5-1D	1
R8	RESISTOR, Fixed WW, 40K ohm, ±5%, 100W	5-1D	2
R9	Same as R8	5-1D	3
R10	Same as R8	5-1D	4
R11	Same as R8	5-1D	5
R12	Same as R8	5-1D	6
R13	RESISTOR, Flat, Fixed, WW, 25 ohm ±5%, 20W	5-1D	7
R14	Same as R13	5-1D	8
R15	RESISTOR, Rheostat, 75 ohm, 12-1/2W	5-1D	9
R16	RESISTOR, Fixed, WW, 6K ohm ±5%, 20W	5-1D	10
R17	RESISTOR, Meter Multiplier, 5 Megohm	5-1D	11
R18	Same as R17	5-1D	12
R19	RESISTOR, Fixed, Comp., 100K ohm ±10%, 2W	5-1D	13
R20	RESISTOR, Fixed, Comp., 10 Ohm ±10%, 1W	5-1C	19
R21	RESISTOR, Fixed, Comp., 1.5K ohm ±5%, 2W	5-1C	20
R22	RESISTOR, Fixed, Comp., 2.7K ohm ±5%, 2W	5-1C	21
R23	RESISTOR, Potentiometer, 500 ohm, 2W	5-1A	22
R24	Same as R23	5-1A	23
R25	RESISTOR, Fixed, Comp., 1K ohm ±10%, 1/2W	5-1A	24
R26	Same as R25	5-1A	25
R27	RESISTOR, Potentiometer, 25K ohm, 2 W	5-1A	26
R28	RESISTOR, Potentiometer, 7.5K ohm, 2W	5-1A	27
RV1	RESISTOR, Thyrite Varistor Assembly, 9KVDC, 21W	5-1E	7
S1	SWITCH, Toggle, 4PST, Contacts: ON-NONE-ON	5-1A	28
S2	SWITCH, Airflow	5-1G	2
S3	SWITCH, Interlock, SPDT	5-1	17
S4	SWITCH, Toggle, DPDT, Contacts: ON-NONE-ON	5-1A	29
S5	SWITCH, Toggle, DPDT, Contacts: ON-NONE-MOM. ON	5-1A	30
S6	SWITCH, Thermal, SPST, 220°C	5-1B	2

Table 5-2 (continued)

SCHEM DESIG	DESCRIPTION	REFERENCE	
		TABLE	ITEM
T1	TRANSFORMER, Beam Supply, 3 Phase, Delta-Wye	5-1	18
T2	TRANSFORMER, Filament Supply, 120V, 50/60 cps	5-1	19
T3	TRANSFORMER, Variable, 120V, 50/60 cps	5-1A	31
T4	TRANSFORMER, Alarm Supply, 117V, 47 to 63 cps	5-1C	22
TB1	TERMINAL BLOCK, 20 Terminal, with marker strip	5-1A	32
TB2	TERMINAL BLOCK, 14 Terminal, with marker strip	5-1A	33
TB3	TERMINAL BLOCK, 6 Terminal, with marker strip	5-1A	34
TB4	TERMINAL BLOCK, 4 Terminal, with marker strip	5-1C	23
TB5	TERMINAL BLOCK, 10 Terminal, with marker strip	5-1C	24
TB6	Same as TB1	5-1C	25
TB7	Same as TB3	5-1C	26
TB8	TERMINAL BLOCK, 3 Terminal, with marker strip	5-1	20
TB9	Same as TB8	5-1G	3
TB10	Same as TB8	5-1	21
V1	AMPLIFIER, Klystron, CW	5-1B	3
W1	CABLE ASSEMBLY, Coax., RG9B/U, 58.50 lg	5-1C	27
W2	CABLE ASSEMBLY, Coax., RG9B/U, 65.00 lg	5-1	22
W3	ELBOW, Miter, with swivel flanges, 50 ohm, 1-5/8 Coax Line	5-1H	3
W4	FLEXIBLE SECTION, 10 lg, 50 ohm, 1-5/8 Coax Line	5-1H	4

SECTION VI

SCHEMATIC DIAGRAMS



NOTES:

1. AC Input: 120/208 volts AC, 50/60 Hz, three phase four wire, 20 amperes per leg. Load P.F. 95%. Input TB104 eight inches below top of cabinet. Four 1/4 x 28 B.H. screws.
   RF Input: 0.5 watts, 1.7-2.4 GHz. Type N Fem. connector ten inches below top of cabinet.

2. RF Output Connector: EIA flange, 1-5/8" Rigid Coaxial line. Flange 1-1/2 inches below top of cabinet.

3. Total Heat Output:
   With no RF excitation, 23,000 BTU/h
   With full RF power output, 16,200 BTU/h

Weight: 725 pounds

Figure 6-1. Installation Drawing Model 2002

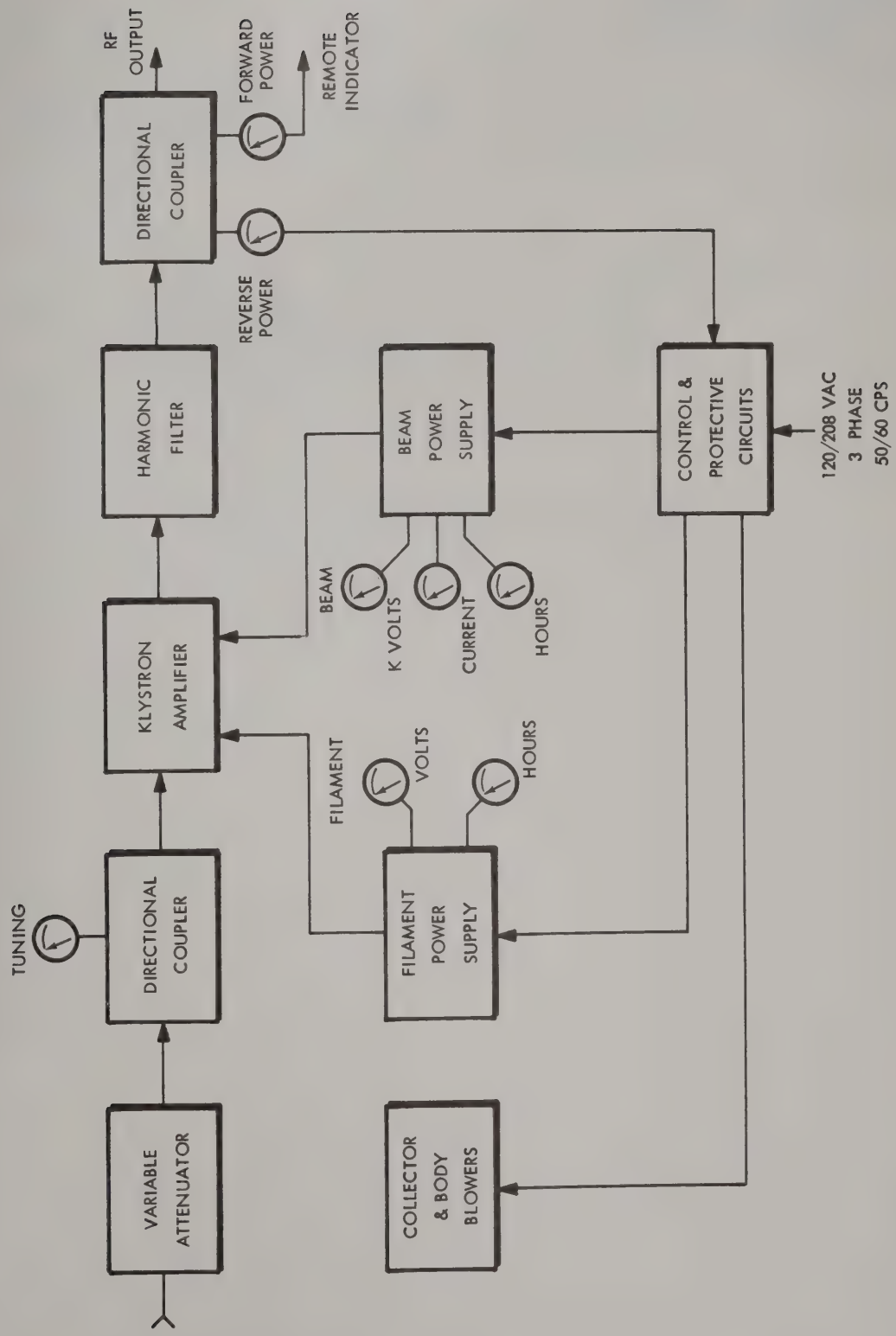


Figure 6-2. Block Diagram Model 2002

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NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

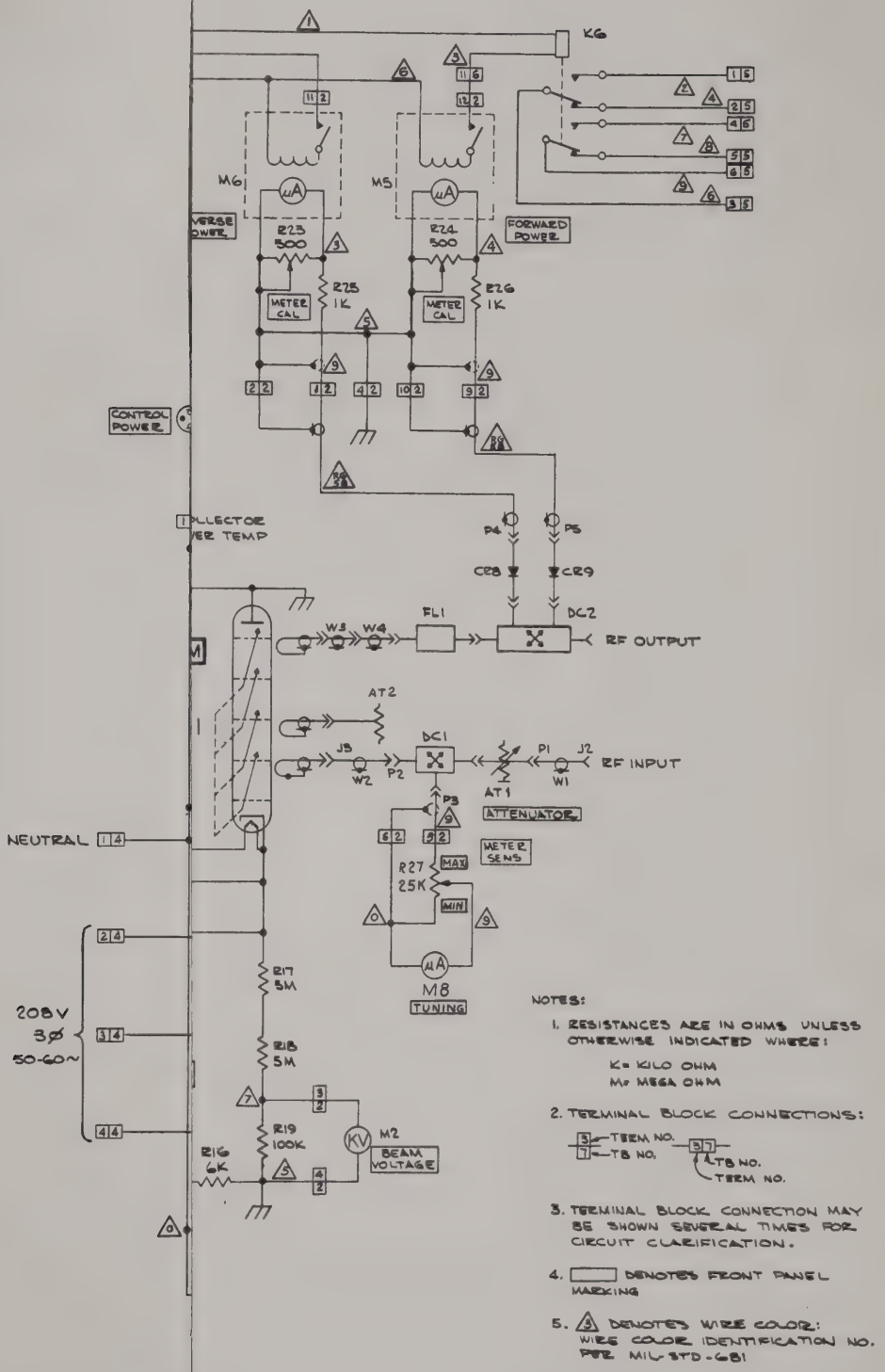
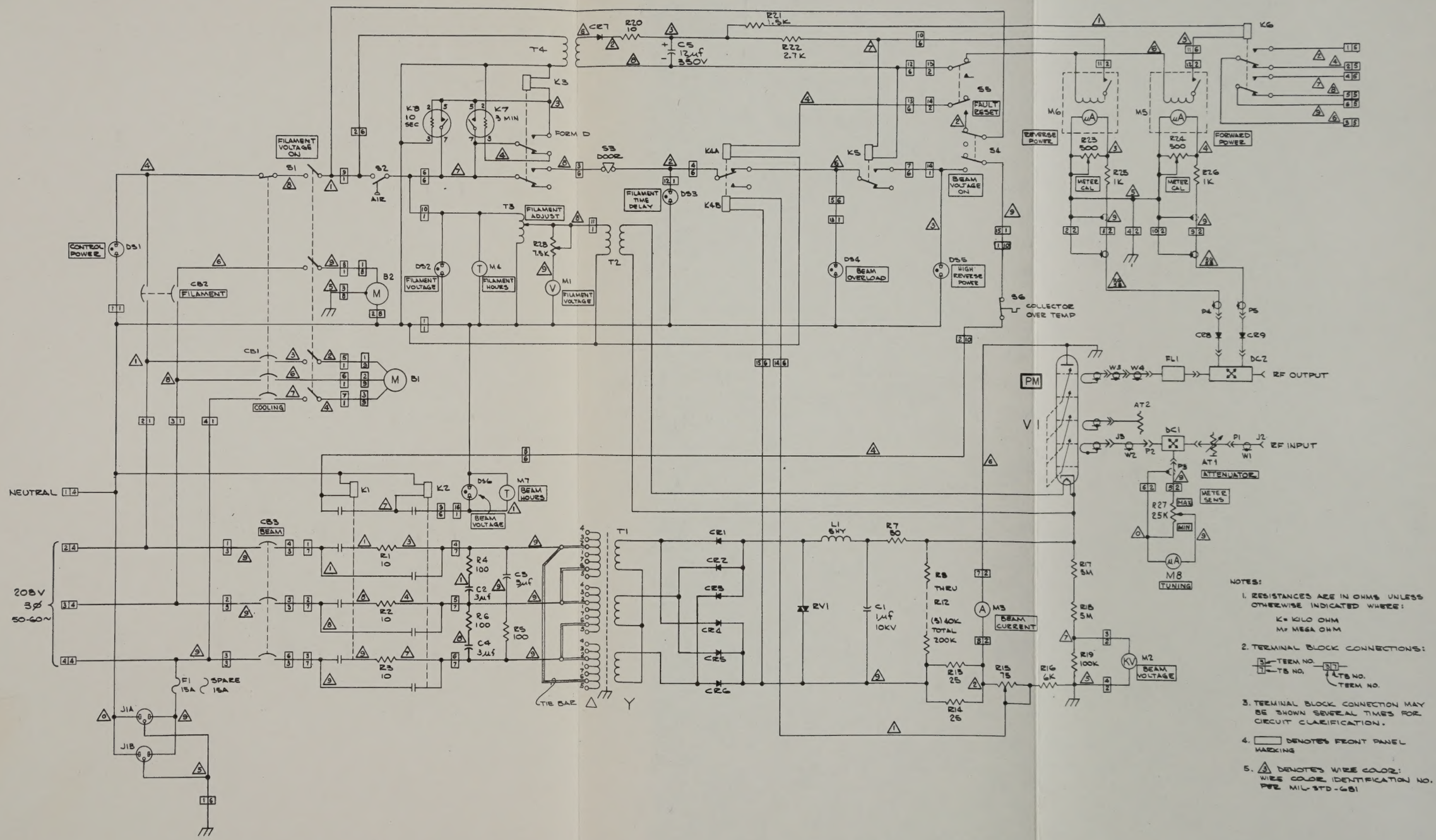


Figure 6-3. Schematic Diagram Model 2002



NOTES:

1. RESISTANCES ARE IN OHMS UNLESS OTHERWISE INDICATED WHERE:
   K= KILO OHM
   M= MEGA OHM
2. TERMINAL BLOCK CONNECTIONS:

3. TERMINAL BLOCK CONNECTION MAY BE SHOWN SEVERAL TIMES FOR CIRCUIT CLARIFICATION.
4. ▭ DENOTES FRONT PANEL MARKING
5. △ DENOTES WIRE COLOR: WIRE COLOR IDENTIFICATION NO. PER MIL-STD-681

Figure 6-3. Schematic Diagram Model 2002